DOCUMENT RESUME

ED 242 342 JC 830 511

AUTHOR Holleman, John J.
TITLE A Master Plan for the Use of Telecommunications for Instruction and Community Services in the Peralta Community College District.
PUB DATE 83
NOTE 142p.; Ed.D. Dissertation, Nova University.
PUB TYPE Dissertations/Theses - Doctoral Dissertations (041) -- Guides - Classroom Use - Guides (For Teachers) (052) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC06 Plus Postage.
DESCRIPTORS *College Planning; Community Colleges; *Delivery Systems; Distance Education; *Educational Technology; Personnel Needs; *Program Development; *Telecommunications; Two Year Colleges
IDENTIFIERS *Peralta Community College District CA

ABSTRACT

A study was conducted to investigate: the types of telecommunications systems available for the delivery of instructional material at higher education institutions; coordinated and integrated telecommunication systems being used by educational institutions, the military, and industry in the United States and other countries; and the current state of telecommunications in the Peralta Community College District (PCCD) and potential for expansion. A review of the literature on telecommunications technologies, and site visits and interviews conducted in the PCCD led to the following conclusions: (1) an extensive telecommunications technology, including radio, broadcast and cable television, instructional television fixed service (ITFS), microwave, slow-scan television, satellite television, and videodisc, is being used to deliver education to non-traditional and distant learners; (2) the PCCD can expand its alternative instructional and community services programs through the development of an integrated, coordinated telecommunication system; and (3) the PCCD has the basic facilities, equipment, and staff necessary to expand its telecommunications operations into a model system. A 5-year plan for the sequential development of a telecommunication system for the district was recommended. Appendices include an inventory of the PCCD telecommunications equipment, a proposed space utilization plan, ITFS authorization information, equipment and personnel requirements, and an outline of the 5-year plan. (Author/HB)

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A Master Plan for the Use of Telecommunications for Instruction and Community Services in the Peralta Community College District

JOHN J. HOLLEMAN

JC 830 511

A Major Applied Research Project
presented to Nova University in partial fulfillment
of the requirements for the degree of Doctor of Education

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ACKNOWLEDGEMENTS

Sincere appreciation and thanks are expressed to many who cooperated in the development and completion of this study.

To the administrative staff and faculty of Vista College who provided information for the study.

To George Beers of DeAnza College, to Kenneth Fawson of Evergreen Valley College, and to Robert Wyman of the Los Rios Community College District who were willing to share information about telecommunications and the challenges and problems of the different types of telecommunication systems and their use in instruction.

To Ione Elioff, Dean of Instruction of Vista College, for encouragement and support for this study.

To Lynn Whitmore for her assistance in editing and for helpful suggestions during the study.

To Dale Tillery, major advisor, for his advice and guidance.

To Ernest Berg, local professional reader, for his suggestions and thoughtful comments.

To George M. Barton, central staff committee member, for his support for the study.

To Nancy Holleman who provided support and encouragement during the study.

Abstract of a Major Applied Research Project Presented to Nova University in Partial Fulfillment of the Requirements for the Degree of Doctor of Education

A MASTER PLAN FOR THE USE OF TELECOMMUNICATIONS FOR INSTRUCTION AND COMMUNITY SERVICES IN THE PERALTA COMMUNITY COLLEGE DISTRICT

by

John J. Holleman

August, 1983

The Peralta Community College District is a multicollege district serving six cities in northern Alameda County east of San Francisco. In a nine-year period from 1974 to 1983 the district's involvement in telecommunications has expanded from membership in a community college television consortium to operating a cable television channel and earth station dish. These activities have been fragmented and have lacked cohesiveness and direction.

This research project was designed to provide information about (1) the types of telecommunications systems available for use in higher education institutions for the delivery of instructional material, (2) coordinated and integrated telecommunication systems being used by educational institutions, the military and industry in the United States and other countries, (3) the current state of Peralta Community College District telecommunications and their potential for expansion.

A review of various resources revealed that there was an

extensive literature on telecommunication technologies are available for use by higher education institutions. These technologies include: radio, broadcast television, cable television, instructional Television Fixed Service (ITFS), microwave, slow-scan television, satellite television and videodisc. Interactive capabilities of the different technologies is described. This interaction may take the form of direct personal contact through telephone, microwave or computer interaction.

Site visits were made to Palomar College, DeAnza College, Evergreen Valley College and the Los Rios Community College and discussions were held with administrators from Maricopa Community College District and Kirkwood Community College on their current and planned use of telecommunications. A literature review provided information on educational consortia and educational organizations that are using multiple telecommunication systems. Telecommunication systems were found to be an important medium that higher educational institutions used to reach non-traditional and distant learners.

The educational use of telecommunications technologies by the military and industry has been primarily videotape and more recently videodisc. Recently industry began to use satellite technology to for teleconferences. Videodisc technology has been used by industry to provide training in sales, new product orientation and technical skills and by the military for technical training and basic skills instruction.

Foreign countries have been actively using telecommunications

technologies in higher education. Five countries were cited that use satellite telecommunications for educational programming.

The telecommunication activities, facilities and equipment of the Peralta Community College District were determined through site visits. Discussions with knowledgeable individuals on each campus provided information on the current use of telecommunications and college plans for expansion.

The study led to the following conclusions: first, an extensive telecommunications technology is being used to deliver education to non-traditional and distant learners; second, the Peralta Community College District can expand its alternative instructional and community services programs through the development of an integrated, coordinated telecommunications system; and third, the Peralta Community College District has the basic facilities, equipment and staff necessary to expand its telecommunications operations into a model system.

A five-year plan for the sequential development of a telecommunication system for the Peralta Community College District was recommended. The following broad recommendations were suggested as the basis for the system: (1) integrate the Peralta Community College's existing telecommunication elements into a districtwide system, (2) immediately activate the district's two ITFS channels, (3) plan and construct a television facility that will serve as master control for Peralta Colleges Television, PCTV, (4) plan for additional ITFS reception sites, (5) prepare for the activation of the cable system in the city of Alameda, (6) actively advocate for

the needs of educational institutions during the cable refranchising of the city of Oakland, (7) plan a series of workshops to inform faculty of the potential uses of an expanded telecommunications network, (8) adopt and implement an organizational plan for the supervision and operation of Peralta telecommunications, (9) develop procedures to allocate broadcast time for instruction and community services, (10) develop a studio and control room at Merritt College, (11) install cable and telephone lines to classrooms on both Laney and Merritt campuses, (12) adopt a plan for the expansion of existing telecommunications and the sequential acquisition of additional telecommunications systems.

TABLE OF CONTENTS

Page

List of Table..... x

Chapter

I Introduction..... 1

Background and Significance..... 1

Research Questions..... 7

Definition of Terms..... 9

Assumptions and Limitations..... 10

II Review of Related Literature..... 12

Meeting the Needs of Distant and Non-traditional Learners..... 12

Means by Which Telecommunications are Used to Deliver Education..... 17

Challenges to the Use of Telecommunications in Higher Education..... 24

III Procedures and Methodology..... 32

A Study of the Types of Telecommunication Systems Available for Use in Higher Education Institutions for the Delivery of Instructional Materials..... 32

A Study of Coordinated and Integrated Telecommunication System Used in Educational Institutions, the Military and Industry in the United States and Other Countries..... 33

A Review of the Current State of Peralta Community College District Telecommunications and Their Potential for Expansion..... 36

Chapter		Page
IV	Results	37
	Types of Telecommunications Systems Available for Use in Higher Education Institutions for the Delivery of Instructional Materials	37
	Coordinated and Integrated Telecommunication Systems That are Being Used by Educational Institutions, the Military and Industry in the United States and other Countries	62
	The Current State of Peralta Community College District Telecommunications and Their Potential For Expansion	87
V	Summary and Recommendations	97
	Summary	97
	Conclusions	100
	Recommendation for Improvement of Practice	101
	Strategies for Diffusion, Implementation and Change	106
Bibliography		110
Appendices		117
	A. Peralta Community College District Telecommunications Equipment Inventory	118
	B. Proposed Space Utilization on the Ninth Floor of the Laney College Office Building for Peralta Colleges Television	120
	C. Instructional Television Fixed Service Frequency Authorization in the San Francisco Bay Area. Federal Communication Commission September 1982	121

Page

Appendices (continued)

D. Equipment Required For the Operation of Two ITFS Channels, A-3 and A-4..... 122

E. Peralta Telecommunications: Proposed Organization of Personnel..... 123

F. Peralta Telecommunications: A Five-year Plan..... 124

TABLE

Page

The Use of Multiple Telecommunications Technologies By Various Higher Education Institutions, Higher Education Consortia, and Professional and Non-Profit Organizations..... 81

CHAPTER 1

INTRODUCTION

Background and Significance

The Peralta Community College District, which is a large, multi-college district, serves two distinct communities. The major service area includes the six cities in Alameda County east of San Francisco: Albany, Alameda, Berkeley, Emeryville, Oakland and Piedmont. The combined population of these cities is in excess of 535,000. The ethnic composition of the population is 8.8 percent Asian, 31.0 percent black, 8.4 percent Spanish surname, 45.7 percent caucasian, and 6.1 percent other, which includes American Indian, eskimo and Aleutian islander (ABAG, 1980). Four Peralta colleges and a skills center serve this urban community: College of Alameda, Merritt College, Laney College, Vista College, and the East Bay Skills Center.

The second community served is Plumas County, a rural county located 250 miles northeast of the urban portion of the district. Feather River College, located in the city of Quincy, serves a county population of 17,900. The five colleges of the Peralta District together enroll in excess of 43,000 students each year.

Vista College, one of the four urban Peralta colleges, is a unique community college in that it does not have a campus. The college offers classes in more than 260 community locations and in two outreach centers operated by the college. As part of its mission, Vista College has a commitment to "...provide service to adults... through the use of alternative instructional strategies" (Holleman

and Yerger, 1981:8).

The Peralta District has demonstrated an interest in telecommunications for almost ten years. In 1973 fifteen bay area community college districts signed a joint powers agreement creating the Bay Area Community College Television Consortium, and the Peralta District joined the consortium in 1974. From 1974 to the present active consortium membership has been Peralta's major effort in telecourse instruction. In 1977, Vista College contracted to broadcast telecourses through Teleprompter of Oakland, a cable television company. This effort was expanded when the Peralta District acquired sole access to one of the two educational channels established by Teleprompter. This district effort began in the spring of 1980 when Peralta began cablecasting with call letters of PCTV. Vista College has been the primary college of the Peralta District to offer telecourses on PCTV.

In 1981, Vista College began to utilize telecourses broadcast by the College of San Mateo over their UHS channel, Channel 60, KCSM. The use of KCSM courses has enabled Vista College to double its telecourse program; the college offered 33 courses in the 1981-1982 academic year. In addition to KCSM, Vista College has also utilized the telecourses being broadcast by the Public Broadcasting System on the PTV-3 network.

Telecourse activities in the other urban Peralta colleges have been sporadic. The three colleges have occasionally participated in the Bay Area Community Colleges Television Consortium's telecourse offerings. When consortium telecourses are also offered over

Peralta's cable channel, one or more of the campus-based urban colleges have occasionally elected to include them in their instructional schedules. These telecourse activities have provided alternative learning opportunities for 500 to 900 students per semester at Vista College and an additional 50 to 120 students at the other urban Peralta colleges.

The telecourse activities of the Peralta District to date have been fragmented and have lacked cohesiveness and direction, and there has not been cooperative planning among the four urban colleges as to the telecourse activities of each institution. In 1980, a Peralta Telecommunication Commission was formed to bring about a coordination of efforts. The commission has met once or twice a year but has focused its activities on the programming of Peralta's cable channel. Consequently its effectiveness as a district coordinating and planning body has yet to be realized. New and planned activities for Peralta telecommunications will require that this commission become more actively involved in a coordinating role.

The Peralta District plans to expand its telecommunications capability to serve all of the district's residents. A total of six new and sophisticated telecommunications projects will help accomplish this objective.

Future activities include operating a recently-acquired five-meter earth station dish, which will permit the district to receive telecourse programming from two sources; the Appalachian Community Service Network and the American Education Television Network, both from Satcom 3. The American Education Television

Network offers educational programming to fill the continuing education needs of a number of professionals who are required by state laws to take a minimum number of educational courses each year to retain their certification or licensure. The Appalachian Community Service Network broadcasts college telecourses.

A second future activity is the expansion of cable television services within the Peralta District. In 1982, the City of Alameda granted a franchise to United Cable Television of Alameda to provide cable television service to residents of the city. The franchise proposal states that UCTA will provide an equipment grant and upgrade the studio facilities of the College of Alameda (UCTA, 1981). In addition, the franchise will assign one channel specifically to Peralta District and three other channels will be committed to higher education programming. Oakland Teleprompter, the cable television franchisee which serves the cities of Oakland, Piedmont and Emeryville, is scheduled to be sold and the new owner proposes to upgrade the system and expand service.

The upgrading of the Oakland Teleprompter system and the installation of a new system in the City of Alameda will include the potential for an interactive two-way cable system, plus the opportunity for what is termed "talk-back television" through which the viewer has audio feedback to the instructor. This interactive cable system could involve either audio-visual interaction or some form of a computer terminal which permits the student to respond to questions from the instructor.

A third activity that the Peralta District is now developing is

the use of Instructional Television Fixed Service (ITFS). The San Francisco Bay Area has seven major ITFS frequencies, one of which is operated by the University of California at Berkeley. Each frequency is in turn subdivided into four channels. The University has allocated two of these channels for the sole use of the Peralta District.

The ITFS system will offer two major advantages: it will establish an institutional link between the University and the Peralta District; and it will also lead to the expansion of alternative instructional delivery systems in the Peralta District. In terms of interaction, the system will enable telecourses currently offered by Peralta to be offered by the University, and the University will be able to transmit their instructional programs to more sites than are currently served. Additionally, the University will be able to broadcast its various public information programs to the community being served by PCTV, the Peralta cable channel.

The second major advantage of the ITFS system is the expansion on district-wide instructional programming by making telecourse programming more accessible within the district:

1. by connecting the four urban Peralta colleges, Skills Center, three educational centers and 20 to 30 community sites where Vista College has concentrations of courses;

2. by providing an opportunity to link individual sites throughout the district that do not have sufficient enrollment to justify classes at each site;

3. by offering the continuing education needed by the

scientists and engineers at a proposed high-technology industrial park in Oakland; and

4. by enabling Peralta television, PCTV, to connect with all of the cable companies operating within the six cities of the district, through linkage with their headends in the cities of El Cerrito and San Pablo.

A fourth future Peralta effort is the development of a duplex microwave system. This point-to-point microwave TV will interconnect California State University at Hayward, University of California at Berkeley, the Office of the Alameda County Superintendent of Schools, College of Holy Names, Mills College and the Peralta District in a proposed multi-level Higher Education Television Consortium (HITEL). An application has been submitted to the National Telecommunications and Information Administration for funding the consortium. The proposal would integrate the existing telecommunication components and create an effective system for delivering the instructional, informational, cultural and entertainment resources of the consortium institutions to home cable television viewers.

A fifth activity that Peralta is pursuing is the establishment of a center to evaluate the instructional materials developed by recipients of Annenberg Foundation grants. Six projects were selected by the Foundation for the first funding phase in 1982. Four of these projects were for the development of telecourses; one project was an audio and radio series of correspondence courses; and the last one was for the development of an interactive videodisc instructional program in physics, chemistry and biology. The

proposed evaluation center would involve the members of the HITEL consortium and, if funded by Annenberg, would provide operational equipment and staff.

The last telecommunication activity that is developing is a relationship with the major municipal library systems. The two largest library systems, Oakland and Berkeley, have explored with Vista College staff their desire to develop learning centers in certain libraries. The libraries would be included in the ITFS system, and have the capability to offer courses by video cassette.

Current and proposed telecommunications in the Peralta District could result in an educational television network that could serve as model for other metropolitan areas. Careful planning and coordination will be crucial to the success of the network and its duplication possibilities. Planning and coordination of individual and joint telecommunications efforts among the four urban Peralta colleges is minimal at present. Without a central district telecommunication plan and coordinating mechanism, future activities that occur will result in duplication of programs, excess costs, minimal student participation due to the duplicated programs and minimal faculty support.

Research Questions

This Major Applied Research Project, MARP, was designed to assist the Peralta Community College District to achieve a master plan with a timeline for the coordination, implementation and development of a district-wide telecommunications network. The major

goal of the MARP was to prepare a five-year plan for the sequential development of telecommunications in the Peralta District. The subgoals were: (1) a plan for the integration of all the elements into a districtwide system; (2) a facilities and equipment proposal and plan; (3) an operational plan for personnel; and (4) a programmatic plan for both instructional and community services.

Three questions were central to this project to the District's future efforts in the area of telecommunications:

- What types of telecommunication systems are available and being used in higher educational institutions?
- Are any higher educational institutions, or other types of institutions, utilizing more than one type of telecommunications in a coordinated and integrated way?
- Does the Peralta Community College District have the facilities and equipment for an expanded and integrated telecommunications delivery system?

In order to answer these research questions, the research project was designed to include three separate components:

1. a study of the types of telecommunications systems that are available for use in higher education institutions for the delivery of instructional materials;
2. a study of coordinated and integrated telecommunications systems that are being used by educational institutions, the military and industry in the United States and other countries; and
3. a review of the current Peralta Community College District

telecommunications activities and their potential for expansion.

Definition of Terms

Several key terms are used in the description and analysis of this research project. They are defined as follows:

BROADCAST TELEVISION. This term includes VHF, UHF, high power and low power television. This is the most widely used means of telecommunications. Very high frequency (VHF) and ultra high frequency (UHF) are most commonly used for commercial broadcasting, with specific channels allocated for public television.

CABLE TELEVISION. This term refers to a delivery system for television. It is a hardware communications system that transmits a signal over a coaxial cable to television sets.

EARTH STATION DISH. A five meter diameter antenna that receives a signal from an earth satellite.

EARTH SATELLITE OR GEOSTATIONARY SATELLITE. An orbiting satellite in a stationary orbit that relays transmission signals from one point to another.

HEADEND. A term used to designate the point of signal transmission on a cable. Used with cable television.

INSTRUCTIONAL TELEVISION FIXED SERVICE (ITFS). A microwave transmission system that has been specifically designated by the Federal Communications Commission for use by non-profit entities for instructional, cultural or other educational

programming. It requires a special transmitter and receiver.

INTERACTION. A term used to describe a two-way communication capability. ITFS and some cable systems have the capacity for two-way audio and visual communication.

MICROWAVE. A frequency range of signal transmissions that are beamed from visual point to point.

TELECOURSE. An integrated learning system which is comprised of video programs, study guides and exercise materials, textbooks and other study aids.

VIDEODISC. A disc similar in shape to a phonograph record that has both video and audio tracks. Available in laser or stylus formats.

VIDEOTAPE. A means to store magnetic impulses on a tape that has playback capabilities.

VIDEOTEX. A term for a two-way information delivery system that can use telephone lines, coaxial cable or other modes of transmission. Videotex is a system which provides a public-accessed, interactive information retrieval service.

Assumptions and Limitations

The following assumptions were important in the selection of research activities:

1. Telecommunications is one means of providing alternative learning opportunities to residents of the Peralta Community College District.
2. A number of different telecommunications systems could be

used in instructional delivery.

3. By coordinating and integrating the telecommunication activities of the four urban Peralta colleges, a more functional and effective system would be formed.
4. Information resulting from this study will be helpful in the coordination and integration of the Peralta Community College District's telecommunication system.

The activities and conclusions of this study are subject to the following limitations:

1. The study will be limited to a plan for the community served by the Peralta Community College District.
2. The study will not be able to predict future developments in telecommunications and their potential educational applications.
3. The study will not attempt to propose the development of an ultimate state-of-the art telecommunications system.
4. The study will not attempt to demonstrate that a telecommunications system will improve instruction for students.
5. The study will be limited to recommending a master plan for a Peralta Community College District Telecommunications System and will not be concerned with implementation and evaluation.

CHAPTER II

REVIEW OF RELATED LITERATURE

The literature review here focuses on the emergence of telecommunications as a medium to meet the needs of distant and non-traditional learners, the means by which telecommunications are used to deliver education, and challenges related to the use of telecommunications in higher education.

Meeting the Needs of Distant and Non-Traditional Learners

Dorothy Knoell (1976) reported in a study of enrollment in California Community Colleges that the colleges should recognize the characteristics of their students. She pointed out that part-time students have increased in number to where they represent more than two-thirds of the total enrollment. These students have short-term needs with limited objectives. Pratt (1980:1) reported that in the 1960's and early into the seventies "...the dominant enrollment pattern indicated that about two-thirds of students...carried half to full-time credit loads. Now...up to two-thirds of the students are...taking one or two courses."

Non-traditional students, who are older, part-time, employed, and non-traditional programs have received a great deal of attention in recent years. Cross (1980:1) states that "Non-traditional students are older, part-time learners who, at present, are usually educationally independent, well motivated, and above average in academic ability." The number of adults who are involved in non-traditional post-secondary educational courses or programs is

increasing each year. Hodgkinson (1980) has estimated that there are between 42 and 45 million adults actively taking courses in non-educationally sponsored programs. This estimate is supported by Maxwell (1980:6) who states that they are "...more than 30 million continuing education enrollments annually...."

In another study which described changes taking place in the educational system in America, Niebuhr (1983) points out that five megatrends or shifts are occurring. These shifts are (1) expanded, explicit goal setting, (2) expanded intentional learning, (3) increased self-directedness in learning, (4) lifelong learning, and (5) the learning system framework. These shifts recognize that many individuals are electing to determine what they need to learn, when they need to learn and how they are going to learn. These shifts that are taking place in American education result from the needs of adults who are the "new students" of the eighties.

In the same study on non-traditional learners Cross (1980) foresees a time when a college education is less likely to be associated with a particular college campus but rather the education will be drawn from multiple institutions. This situation will develop as the student balances the competition of family and job with an education which results in the student being part-time and having to take a much longer period of time to achieve his or her goal. Yarrington in 1979 recognized that the approximately 500 community colleges established in the United States in the 1960's were created to provide access for young people coming out of high

school but once they were in place older students enrolled. The colleges responded to the needs of the middle-aged re-entry woman and the needs of older workers for retraining and pre-retirement planning. Peter Drucker (1981:30) stated, "The fastest growing industry in America today may be the continuing professional education of highly schooled midcareer adults."

In support of telecommunications as the medium to reach the non-traditional student, Morris (1975) stated that non-traditional programs developed as a result of a "...response to the educational needs of those students who, for whatever reason, will not or can not participate as normal on-campus students." As the numbers of adult learners who are taking courses offered by employers and professional organizations increases each year Morris proposes that television be the educational delivery system. Two studies (Holleman, 1982a,b) of students who were enrolling in telecourses offered by open broadcast or cable showed that the largest percentage of the students were taking the courses for job related need and personal interest.

In a report prepared for the Board of Governors of the California Community Colleges, Peterson and Berg (1981) concluded that because of their diverse student populations community colleges should attempt to provide many different opportunities for learning. They reported on the different modes by which courses and programs are offered: mediated study, directed study, television, radio and newspaper. In recognition that many students, including the employed, the elderly, the disabled, homemakers and those living at

some distance from the campus, are unable to attend regularly scheduled classes, they recommended that colleges expand their independent study offerings. This expansion would provide a greater educational opportunity for individuals who traditionally have not engaged in higher education.

It was stated by Morris in 1975 that television was a mature and proven technology that had been demonstrated to be viable educationally and economically when used as an alternative instructional delivery system. Yarrington in 1979 reported that 400 community colleges were using television to reach previously unreached adults. Two years later Luskin (1981) reported that more than 600 colleges nationwide offered courses for college credit utilizing cable, commercial and public broadcasting stations. The expansion of the cable television industry in the past ten years has provided greater opportunity for colleges to meet the demands of learners at a distance from the college.

To expand the uses of telecommunications to offer educational options to adults the American Association of Community and Junior Colleges (AACJC) conducted in 1978 a survey designed to foster cooperation between community colleges and public broadcasters in which over one thousand community and junior colleges in the United States participated (Kressel, 1980). The survey showed that sixty-five percent of the responding community colleges used television for instruction, both for on-campus and off-campus classes. The AACJC convened a national assembly in 1979 to discuss

the implications of the survey and to develop the mechanisms by which community colleges and public broadcasting stations could work together to serve adult learners.

A number of regional and national efforts have been started to provide instruction for distant learners using telecommunications: University of Mid-America; Central Educational Network; "Sunrise Semester" a joint project of Columbia Broadcasting System (CBS) and New York University; Learn/Alaska Network; National University Consortium; and in Canada the Knowledge Network of British Columbia. Two of these efforts, University of Mid-America and "Sunrise Semester" stopped operations in 1982. The University of Mid-America's mission was perceived as providing access to postsecondary education for adults through a multistate consortium. During its eight year existence, 1974 to 1982, the University enrolled 20,000 adults students who it appears would not have been able to continue their education except by television (McNeil and Wall 1983). "Sunrise Semester" was broadcast for twenty-five years by CBS over its affiliate stations. During 1982 only forty-two affiliates carried the program and only forty-seven students were enrolled.

In 1982 a project, ALLTEL, Assessing Long Distance Learning via Telecommunications was funded by the Fund for the Improvement of Postsecondary Education. The project developed from the awareness that there is an increasing utilization of telecommunications to deliver postsecondary education to the home and workplace. The

project is the joint action of the Council on Postsecondary Accreditation and the State Higher Education Executive Officers Association to examine the problems and issues of accreditation and state licensure involved in long distant learning by telecommunications. Luskin (1980:43) believes that "Full-time citizens, part-time students from every corner of American life, will be the beneficiaries of our emerging human-centered telescaped future of adult learning."

Means by Which Telecommunications are Used to Deliver Education

The telecommunications formats used to deliver educational material to learners include radio and telephone, as well as video technology: satellite transmission systems, cable television, instructional televsion fixed service, videocassette and videodisc personal video systems, slow-scan television and videotex. An emerging strategy in the use of these technologies is the thrust to have two-way communication between the originator and the student (Frye, 1983).

The use of the telephone as a technology to deliver instruction has recently come into its own with the development of conferencing bridges. Audio-teleconferencing has its greatest utility when it is used to serve widely dispersed populations. Examples of audio teleconferencing are: Learn/ALASKA, which operates ninety-nine conferencing sites in sixty-one communities (Demmert, 1981); the University of Wisconsin-Extension, which operates the Educational Telephone Network, which connects 200 locations statewide, and the

Statewide Educational Extension Network, which adds graphic transmission capability to thirty-five of the sites (Ruggles et al, 1982); Rio Salado Community College, which uses audio-teleconferencing in combination with slow-scan television (Lewis, 1983); Queensborough Community College which uses the technology to provide instructional services to handicapped and homebound students (Lewis, 1983).

Radio has been used in education since the 1920's, but Grayson (1982) believes that it has become the forgotten medium with respect to instruction; according to a 1978 study, only three and two-tenths percent of all broadcasts of public radio stations which qualified for assistance from the Corporation for Public Broadcasting was instructional programming. It should be emphasized that these public radio stations represented only twenty-two percent of all public radio stations because most public radio stations are too small to receive Corporation support. However, Lewis (1983) reported that there is a growing interest in radio as an instructional medium. For example, Central Piedmont and Rio Salado Community Colleges are reported to use FM subsidiary Carrier Authorization to provide reading services to the visually handicapped and blind.

The use of video technologies by American higher education institutions has grown rapidly in recent years. This rapid growth is related to an increase in the number of ways that video programs can be delivered to distant sites. The two most important technological advances are the development of satellite and cable

transmission systems (Shulman, 1981). The use of satellite transmission systems is ideal for serving scattered populations over widely dispersed areas. As Ruggles (1982:34) has pointed out: "Since the cost of providing satellite communication is not related to distance, remote communities can be served as cheaply as...more central locations."

Receiving a satellite signal can be expensive for an individual, but signals received by and distributed over a cable system have the potential of reaching many of thousands of individuals. The Appalachian Community Service Network (ACSN) and the American Educational Television Network (AETN) are two educational satellite networks. The Appalachian network is currently broadcasting to more than 200 cable systems that have a total of more than one and a half million subscribers. The American Educational Television Network has not commenced broadcasting but has indicated that its programming will focus on continuing educational programs for professionals who require relicensure and recertification courses.

In many areas of the nation, the opportunity to expand cable into new areas and upgrade existing systems has resulted in dramatic growth patterns in the cable industry (Luskin, 1981). Cooney (1983) reports that the National Cable Television Association estimates that 31.1 million households are connected to cable. Baltzer (1980) reported that 4,000 cable systems served 9,000 communities in the United States. Cable television, with its expanded number of

channels, clearly provides an unparalleled opportunity for educational access.

As the number of channels increases in a system, most franchises have set aside educational access channels. In a study which included forty-two colleges and universities, it was reported that nineteen used cable television to broadcast instructional programs. When sixteen consortia from the study were included in the analysis, a total of 315 institutions (or eighty-two percent) used cable television. The use of cable varied from the degree credit courses to courses for professional continuing education and non-credit community service programming (Lewis, 1983).

Cable television is more than a television medium; it is becoming a communication network for municipalities by serving as a link for schools, libraries, hospitals and police and fire departments (Brown, 1983). In the communities of the southern region of San Francisco Bay, linkages are developing between the municipal, education and fire departments (Beers, 1983). A consortium of three community college districts Television Learning Consortium, is working with six different bay area cable companies to arrange system interconnects which will permit instructional programming to be received by 134 thousand residences.

Statewide cable linkages have also been developed. A consortium of Pennsylvania cable companies and Pennsylvania State University has formed PENNARAMA, a system that can reach 1.5 million households in the state (Lewis, 1983; Lyle, 1983). The system has

two data and eight video channel, and programming can originate from any point in the system. Two consortia that use cable exclusively are the New Jersey Community College Consortium (Freund and Weisner, 1982) and West Central Wisconsin Consortium (Profiles, 1982). The New Jersey consortium involves fifty-nine cable systems and eighty-five thousand subscribers; the Wisconsin consortium serves a rural county with three thousand cable subscribers and eight small school district, each with its own cable channel.

As more communities are cabled, educational institutions can benefit from access to channels and from equipment and facility grants provided by the cable company. California State University at Fullerton, Fullerton College, DeAnza College and the College of Alameda are examples of institutions that have received substantial grants: $500,000 to California State University at Fullerton (Gross, 1982); $250,000 to DeAnza College (Beers, 1983), $185,000 to College of Alameda (United, 1981).

Cable television has the capability of being a two-way interactive system. One of the best known two-way interactive systems is Warner-Amex Cable's Qube system (Brown, 1983; Ruffles, 1982). In addition to a channel selector each subscriber has a small key pad microcomputer terminal. Individuals can communicate with a central computer through their microcomputers. When used for educational purposes, the central computer can summarize and analyze student responses to questions asked by the faculty. Another two-way interactive system is being used on an experimental basis in Japan.

This system, HI-Ovis, differs from Qube in that it is two-way audio and visual (Murata, 1981). Subscribers have a television camera and microphone mounted above their television sets. By flipping a switch the viewer can come on the cable channel and be seen by all subscribers and the originator of the program. Used educationally, each student can interact with the instructor and can receive individualized attention

Other experimental uses being made of cable systems are in the fields of teletext and videotex. Teletext is one-way information transmission which requires a special decoder for the signal to be received. The most frequent and widespread use of teletext is closed captioning for deaf television viewers, (Hecht, 1983). Videotex differs from teletext in that it is a two-way system. Videotex systems require a special microprocessor and signal decoder. Four videotex systems have been extensively used: Telidon (Canada), Prestel (British), Antiope (France) and Captain (Japan) (Ruggles, 1982). An example of the experimental videotex systems now being developed is INDAX by Cox Cable with California State University at San Diego and the University of Nebraska at Lincoln (Telescan, 1982a). The INDAX system allows the student to interact with a central computer through the use of a keyboard microcomputer and a cable converter. The use of INDAX's is being studied in terms of a variety of activities, including learning, testing and the retrieval of information.

Instructional Television Fixed Service, ITFS, is a part of the microwave frequency spectrum that the Federal Communications

Commission has allocated for educational, medical and other non-commercial interests. The frequency spectrum has been divided into twenty-eight channels, seven blocks, of four each. The broadcast signal has a range of thirty miles along the viewers line-of-sight. ITFS is used to transmit television programs to specific reception sites where special antennae have been installed to receive the signal.

ITFS has been used to provide instruction to industrial offices, hospitals, schools, and cable system headends (Shulman, 1981; Gross, 1983; Morris, et al 1975; CPBC, 1983). The University of California at Berkeley, Stanford University and the University of Southern California are using ITFS to broadcast educational programming for professionals in various engineering fields (CPBC, 1983). California State University at Chico uses ITFS to link up with the University of California at Davis to enable students at either institution to take courses at the other institution. California State University at Chico also uses ITFS to broadcast programming to learning centers and cable system headends in northern California (CPEC 1981).

In 1980, the Federal Communications Commission began a review of the allocation of ITFS channels. In May of 1983, the commission made eight of the twenty-eight available for commercial broadcasting because the channels reserved for education were not licensed or being used in many areas. As Reed (1982:4) pointed out "...ITFS can play a critical role in...education," and if lost "there is no substitute...." The educational opportunities that these ITFS

frequencies could have provided in their communities will not be realized or regained because of the reassignment of broadcast frequencies.

Educational institutions, both singly and in consortia, have used a variety of telecommunications technologies to deliver educational programs. The satellite educational service, Appalachian Community Service Network, is used by colleges as another source of programming. The telecourses offered by the Public Broadcasting Service's Adult Learning Service has been used by over six hundred higher educational institutions in the last two years (Telescan, 1982b).

In 1982 the public Broadcasting Service developed a concept paper which proposed the establishment a National Narrowcast Service, which would provide educational programming throughout the nation. This proposed service would use a nationwide IFTS station system of 120 channels linked together through the existing public television domestic satellite interconnection system (PBS, 1982). The project would greatly expand the educational programming of public television stations. It is anticipated that the proposed service will offer formal postsecondary courses, specialized programming for in-service career training and professional development, programming on current developments in professional and technical fields, and cultural programming.

Challenges to the Use of Telecommunications in Higher Education

The challenges to the use of telecommunications in higher education have been discussed by Van Camp (1981), Luskin (1983),

Frye (1983). The challenges to the use are a lack of: (1) expertise in the use of telecourses by faculty; (2) understanding of cost factors; and (3) expertise and understanding of the technology of telecommunications.

Many educators view the use of telecommunications in higher education as a threat or a fad. In his discussion of twenty telecourses myths, Luskin answers the many concerns raised by faculty. The major concerns of faculty are related to the nations that: (1) classroom teachers will be replaced; (2) courses by television will replace courses on-campus; (3) courses by television are not as rigorous as on-campus courses.

The perception that faculty will be displaced or replaced by telecourses is not supported by the facts. In fact, faculty are directly involved in the production and offering of telecourses. The faculty role is often modified, but instructional leaders or facilitators are very necessary elements in telecourses and other educational uses of telecommunications.

It is also worthwhile to note that telecommunication is an appropriate and preferred teaching and learning method for some faculty, for some students, for some instructional contexts. As Luskin pointed out, many students do not like or do well in telecourses. These students desire the learning atmosphere and personal interaction that they get in a classroom.

Instead of replacing faculty or on-campus courses, telecommunications may in fact draw more students into traditional learning situations. In a study on the impact of distant learning on campus

enrollments, Brown (1982) found that students who engaged in a distant education program were encouraged to continue their education, most often in a traditional campus program. In an assessment of the preferred instructional mode of students enrolled in alternative instructional delivery course, twenty-five percent of the students indicated that they preferred to learn in a classroom, but had taken television courses because they fit their personal or work schedules (Holleman 1982a). As Frye (1983:89) stated:

> Faculty needs reassurance that improving productivity through new learning systems will not result in a loss of status or benefits. Quite the contrary, faculty should understand that breaking the constraints of classroom instruction can lead to greater rewards and success. In new systems, the faculty member is often more of a learning manager than a classroom teacher. This opportunity will be attractive to some, but not all faculty.... It is not likely that traditional classroom instruction will ever disappear.

It is unlikely that telecommunications will ever completely replace on-campus face-to-face learning activities for many reasons, not the least of which is the high cost and technical expertise required for instructional telecommunications. For example, Luskin points out that the development time for a telecourse is from two to four years, at a cost of hundreds of thousands of dollars. Many colleges offer as many as 600 different on-campus courses each semester. He concludes that telecourses will never replace all campus courses; instead they will represent a small fraction of all courses offered for the foreseeable future.

Implied in the statement that telecourses are not as rigorous as classroom courses is a threat to the faculty role in the

instructional process. Faculty contend that telecourses are less demanding of students because: (1) telecourses require only television viewing; (2) telecourse students learn less than classroom based students; and (3) faculty have little or no role in course content and telecourse instruction.

In responding to these concerns, Luskin describes the complex, extensive involvement of faculty in ever aspect of telecourse development and instruction. A finished telecourse is not just a series of thirty one-half hour programs. It is an integrated learning system that involves a textbook, a student study guide and an instructional guide for the faculty. Not reassured by this direct and continuous faculty involvement, a group of campus-based faculty recently challenged the academic value and transferability of several telecourses (Coastline, 1983). As a result of this formal complaint, a committee of administrators and faculty from the University of California and the California State University carefully reviewed the telecourses in question. The California State University and College report concluded that the telecourses indeed had academic merit and recommended continued acceptance of the courses for transfer credit. The report from the University of California has not yet been completed.

The idea that telecommunications technology is a fad and will fade from the educational scene does not take into account the extent to which telecommunications is an integral part of our society. The recognition that higher education must incorporate telecommunications technologies as an alternative delivery system has been stated by

Blessington (1981), Dede (1981), Gaynor (1981), Luskin (1981) and Frye (1983). Luskin (1983:60) states it best: "If education does not embrace alternative learning systems, it appears that industry will."

Frye concludes that "the range of possibilities offered by telecommunications systems for higher education is enormous." As telecommunications technologies are incorporated into higher education instruction it will greatly enhance the access to educational opportunities of individuals who would otherwise not have participated in higher education.

The cost factors of telecommunications are sometimes deterrents to their use. The cost of broadcast television is prohibitive to higher education institutions due to cost to license, own and operated high-power stations and the cost to develop programs of broadcast quality. Morris (1975) reviewed the costs of various telecommunications technologies used to reach individuals in their homes: broadcast television $300-$1,000 per hour; videocassette $20-$30 per hour after an initial outlay of $750 for the video-cassette players; and cable television headend equipment at an initial cost of $1,000. He concluded that cable television was the most economical and convenient for students.

In an analysis of the per hour cost of ITFS educational broadcasting, Curtis and Blatecky (1980) reported a range from a low of $17.41 per hour to a high of $58.94. This range was still considerably below the $90 per hour for Multipoint Distribution Service, a microwave frequency band used by private business to

broadcast entertainment programs. The capitol investment in an ITFS broadcast facility varied from 66 to 250 thousand dollars per year based on a ten year amortization.

The cost of producing and using telecourses can be a deterrent to their use of telecommunications. The cost to produce a telecourse of superior educational quality ranges between $250,000 and $1,000,000 (Luskin, 1983). These costs are recovered by leasing the telecourse to higher education institutions or consortia. To lease a telecourse varies from $1,500 and $3,500 depending on the telecourse and producer. A per student fee of $10 is generally included in the lease agreement. With the development of the Adult Learning Service by the Public Broadcasting Service telecourses are now available on local public stations. If a college elects to use a telecourse broadcast on the local public station there is a participation fee of $350 to $500, and a per student fee of $15.

As the cost for telecommunication equipment declines it can be assumed that their use by the generally public and higher education will increase. Students will be able to have their own receivers or videocassette players and use them as learning tools (Blessington, 1981).

Another challenge to the use of telecommunication is the lack of expertise and understanding of the technologies by the higher education community. The lack of expertise and understanding of telecommunication technology has been discussed by Maftoon (1982), Price and Marsh (1983), Frye (1983) and Morris (1975). The faculty's

lack of knowledge of how to use instructional media equipment, specifically instructional television, was the major reason for not using instructional television (Maftoon, 1982). This situation is supported by King (1979) who stated that teachers and administrators were trained using traditional methods and equipment and are uncertain about the technological changes taking place.

Blessington (1981) points out that the use of telecommunication technologies in higher education is behind their use in other areas. He believes that in order for education to understand the impact of television it must experiment with the technology in order to become conversant with its applications. To achieve a state of ease with the medium he proposes that faculty acquire telecommunications skills which would lead to an understanding of how telecommunications can relate to their work.

Higher education's lack of expertise in telecommunication technologies was recognized by Morris (1975) when he recommended that engineers get involved in the on going process of extending universities to distant learners. He view the telecommunication revolution taking place in higher education as being guided by professional educators who do not have the necessary technical knowledge. By working together educators and engineers can develop a telecommunication network that will be economically viable and academically sound.

Recognizing that telecommunication technologies will be an important part of higher education's future Young (1981) suggested activities for educational institutions if they expect to be

successful in that future. The activities are: (1) increase the media literacy in educators and administrators; (2) accommodate new technologies which have potential; and (3) become more interactive with institutions in the community that offer mediated information and instruction.

Baltzer (1982:42) summarizes it best when she stated "Technologies are constantly changing and new discoveries being made. We must be able to add, delete, and create new combinations of technologies so that we can survive the transition into the new information society...." The purpose of this MARP was to investigate ways to integrate the telecommunications activities of the Peralta Community College District to serve distant learners.

CHAPTER III

PROCEDURES AND METHODOLOGY

The research project is composed of three components: (1) a study of the types of telecommunications systems available for use in higher education institutions for the delivery of instructional material; (2) a study of coordinated and integrated telecommunication systems that are being used by educational institutions, the military and industry in the United States and other countries; and (3) a review of the current state of Peralta Community College District telecommunications and their potential for expansion. The following sections describe the procedures and methods that were used in each component of the research project.

A STUDY OF THE TYPES OF TELECOMMUNICATIONS SYSTEMS AVAILABLE FOR USE IN HIGHER EDUCATION INSTITUTIONS FOR THE DELIVERY OF INSTRUCTIONAL MATERIALS

In order to find material and resources which would be useful for understanding the different telecommunications technologies that are available for the delivery of instructional materials by higher education institutions, a search of the literature was made through conventional library research methods and a computerized search of ERIC documents. A computer search of the American Association for Higher Education's Center for Learning and Telecommunication's two computer databases was conducted. These databases provided current general literature and technologies information. In addition,

individuals who are extremely knowledgeable in the uses of certain technologies were asked about the current use of the technologies and their future potential for being used and in an integrated and coordinated manner.

The study process included a collection of materials which described the various technologies and their uses in both four-year and two-year institutions. Books, periodicals and pamphlets were reviewed, and after careful consideration those materials and resources that were most appropriate were selected for inclusion in the study.

Included in the study were radio (primary carrier), radio subsidiary carrier authorization, audio-cassette, broadcast television, cable television (one- or two-way and viewer-response), instructional television fixed service, satellite television (one- or two-way), microwave, slow scan television (one- or two-way), electronic blackboard and interactive graphic television, videodisc, videotex and teletext.

A STUDY OF COORDINATED AND INTEGRATED TELECOMMUNICATION SYSTEMS USED IN EDUCATIONAL INSTITUTIONS, THE MILITARY AND INDUSTRY IN THE UNITED STATES AND OTHER COUNTRIES

A study of the uses of integrated telecommunication systems in educational institutions was made through on-site visits, written communications and telephone conversations. The study of the uses of integrated telecommunications by industry and the military, in the United States, and foreign countries was accomplished through a

search of the literature using standard library research methods.

On-site visits were made to three community colleges and one community college district office: Palomar College in San Marcos, California; DeAnza College in Cupertino, California; Evergreen Valley College in San Jose, California; and the Los Rios Community College District in Sacramento, California. A visit was made to the Association for Continuing Education offices and production center, located at Stanford University in Palo Alto, California. The Association is an independent, non-profit educational organization. Communications and discussions were held with representatives of Kirkwood Community College, Cedar Rapids, Iowa and Maricopa County Community College District, Phoenix, Arizona. These institutions were selected because they are currently using one or more telecommunication technologies in delivering instructional material.

At each college visited, administrative staff responsible for telecommunications were interviewed. The discussions with the administrators did not follow a prescribed format, but each administrator was asked similar kinds of questions about the use of telecommunications for instructional delivery. The interviews elicited information about their facilities, extent of current use, and projected future use. The discussions also explored the involvement of faculty in planning and using telecommunications to deliver instructional material.

Palomar College

A visit was made in July of 1982 with Dr. Omar Sheidt, Superintendent-President and Ron Page, Director of Educational

Television. The extent to which telecommunications is used in delivering instructional material was discussed. The facilities were visited and studied.

DeAnza College

In a visit in May of 1983 with George Beers, Dean of the Art Division, the extensive facilities of the college were studied. In addition, materials were collected on equipment being used and on agreements developed with nearby cable television operators.

Evergreen Valley College

A full day meeting with Dr. Kenneth Fawson, Dean of Learning Resources, was held in March of 1983. The college's telecommunication facilities, utilization procedures and operational procedures were observed and discussed.

Los Rios Community College District

Plans for the development of a Sacramento County educational telecommunications network were discussed in detail during a meeting with Dr. Robert Wyman, Director of Telecommunications for the Los Rio District. The initial development of the network is to begin in Fall of 1983.

Association for Continuing Education

A full day meeting at Stanford University in June of 1982 provided an opportunity to discuss the Association's ITFS telecommunications operations with Charles Davis, the Association's general manager.

Maricopa County Community College District

Numerous discussions were held with Paul Elsner, Chancellor, and Jan Baltzer, Director of Instructional Technology and Design, concerning Maricopa's telecommunications system and planned developments.

Kirkwood Community College

Communications were held with Rich Gross, Dean of Telecommunications, to discuss the college's telecommunication system. The system serves a seven-county area with a population of approximately 350,000.

A REVIEW OF THE CURRENT STATE OF PERALTA COMMUNITY COLLEGE DISTRICT TELECOMMUNICATIONS AND THEIR POTENTIAL FOR EXPANSION

In order to determine the current state of the Peralta District's telecommunications activities and their potential for expansion, a visit and a detailed inspection was made at the three urban colleges of the district. In addition to discussions with knowledgeable individuals on each campus as to that institution's telecommuncations activities and potential for expansion, an inspection was made of existing facilities, their current use and any college plans for future expanded use. The telecommunications facilities and equipment at each institution were inventoried and evaluated as to current condition.

CHAPTER IV

RESULTS

This chapter reports the findings of the three components of the study: (1) a study of the type of telecommunications systems available for use in higher education institutions for the delivery of instructional materials; (2) a study of coordinated and integrated telecommunication systems that are being used by educational institutions, the military and industry in the United States and other countries; (3) a review of the current state of Peralta Community College District telecommunications and their potential for expansion.

TYPES OF TELECOMMUNICATIONS SYSTEMS AVAILABLE FOR USE IN HIGHER EDUCATION INSTITUTIONS FOR THE DELIVERY OF INSTRUCTIONAL MATERIALS

A review of the various resources revealed that there is an extensive literature on telecommunication technologies that are available for use by higher education institutions. These technologies can be categorized in several ways depending upon the criteria used. Generally, telecommunications activities can be categorized by their broadcast format: radio, broadcast television, cable television, Instructional Television Fixed Service (ITFS), microwave, slow-scan television, satellite television and videodisc. Other categorizations include audio versus video, interactive versus non-interactive technologies, and open versus limited access to the broadcast materials. Information about telecommunication activities

in higher education institutions is included in the sections, which are organized according to general broadcast formats.

In discussing the different telecommunication technologies, the term non-interactive will be used to describe technologies where the transmission of information is to the recipient who is not able to communicate with the originator at the time of the transmission. In interactive telecommunication systems, two-way communication permits interaction between the individual and the source of transmission. This interaction may take the form of direct personal contact through telephone, microwave, or computer interaction.

Radio:

Education has a long and extensive history of using radio for the delivery of instructional materials. Radio has the advantages in the delivery of educational materials of time, cost effectiveness and a focus on the local community (Ingle, 1974). Individuals within one community and nearby areas can easily receive both commercial and public radio, using either the AM or FM bands. Thus radio provides coverage of a large area with the opportunity to reach a great number of individuals. With the development of low cost radios, this is now a telecommunications medium that is a practical and convenient method for alternative learning.

One of the most widely known examples of the use of radio in instruction is that of the School-of-the-Air programs in Australia. This program extends learning to the remotest areas of Australia for children in the elementary grades, and in some instances through twelfth grade.

In Ontario, Ryerson Open College broadcasts credit courses for first and second year students. The radio courses consist of three one-hour lectures each week for sixteen weeks. The courses are supplemented by telephone contacts (Ruggles, 1982). Keio University in Japan and the Air and Correspondence College of South Korea both supplement correspondence courses with radio broadcasts.

Twenty-one public FM radio stations in California that, in addition to their local programming, receive programs via satellite which increases their educational programming potential (CPEC, 1981). A large number of high schools and colleges have low power FM radio stations that are used for educational programming. Most of these stations are 10 watt and have a limited broadcasting radius of about two miles.

A special group of radio subchannels termed Subsidiary Carrier Authorization have been used by educational institutions. Subsidiary Carrier Authorization (SCA) radio programming is possible because FM radio transmitters can broadcast more than one program simultaneously. A number of colleges and universities are using SCA radio to provide special programming of special interest to a limited population. This type of programming includes reading services for the blind and sight-impaired, post-graduate and vocational instruction, and educational-informational materials. In California, San Diego State University is developing college-level credit courses that can be broadcast using SCA technology.

Another FM radio broadcast opportunity exists with the use of cable television. The cable is capable of carrying FM radio signals

and, in fact, many cable television companies provide FM radio as an additional service. Educational institutions that have cable transmission capabilities can also broadcast an FM signal over the cable. There are no licensing requirements as the Federal Communication Commission does not consider the FM signal to be an open air broadcast.

Even though radio as a communication technology has been around for many years, its potential does not seem to have been completely realized (Callahan, 1982; Grayson, 1981; Ruggles, 1982). One of the major drawbacks to an expanded use of radio is the requirement that students must listen at prescribed times for the instruction. However, with the use of audio-cassettes and the ability to tape radio broadcasts, this technology should have greater use in the future.

Audio-Cassette

The audio-cassette or audio-tape recorder is relatively inexpensive, making this a medium that is economical and easy to use for the delivery of instructional materials. Many institutions offer courses in an audio-cassette format as an alternative to radio courses. In addition to the audio-cassette, the student has other materials to complete, such as reading and assignments. Audio-cassettes enable the individual to control when the material is delivered, the number of times that the material is repeated, and the pace of learning.

The audio-cassette medium is used for language instruction, lectures, and drill and practice routines. The University of

Waterloo in Canada has a very large program of audio-cassette courses, more than 200. These correspondence courses consist of twenty forty-minute lessons with supplemental notes and textbooks (Ruggles, 1982).

The use of the audio-cassette in instruction generally provides very limited interaction between faculty and student. Several colleges encourage students to telephone the faculty for assistance and review. Although audio-cassettes do relieve the time constraints on learning, their potential has not been fully developed.

Broadcast Television

The designation broadcast television refers to commercial and public television stations that use either the very high frequencies (VHF) or ultra high frequencies (UHF). Frequencies between 30 and 300 megahertz (million cycles per second) are termed very high frequencies and include TV Channels 2 to 13. Ultra high frequencies (UHF) are between 300 and 3000 megahertz and include TV Channels 14 to 83.

Broadcast television may also be categorized as high power or low power. High power broadcast television is the dominant television medium used today. Commercial and public broadcast stations are high power stations that tend to reach a regional area. Low power broadcast television has much more limited range, about five square miles, serving segments of large communities or small rural communities (Glen and Shearer, 1982).

The use of high power broadcast television is the principal

television medium used because the equipment to receive the signal is a relatively inexpensive and because its technology has experienced a greater and a more continuing developmental thrust. High power television has been used since the 1950's when two higher education institutions, Chicago's T.V. College and New York University, began to broadcast instructional programming. By 1981, over 600 colleges were broadcasting courses for credit (Luskin, 1981).

The drawbacks to the use of high power broadcast television by higher education are the cost to license, own and operate high-power stations, and the cost to develop programming of sufficient broadcast quality. An additional drawback to the use of high power broadcast television has been the times available for broadcasting telecourses, which usually are during the least desirable hours of the broadcast day: early morning (5:00 am to 6:30 am) and mid-afternoon (2:00 pm to 3:00 pm).

Low-power broadcast television is still in its earliest developmental stages, and thus its potential as a technology for use by higher education institutions is difficult to assess. When the Federal Communication Commission announced in 1981 that it would accept applications for low-power licenses, it received more than 5100 applications. As of March 1982, only nine applications had been approved (Glen and Shearer, 1982).

The vast majority of the applications were from broadcast interests in the private sector. It has been suggested that new broadcast networks will be created as individuals acquire licenses (California Community Colleges, 1982). Low-power broadcast

television could have its greatest impact in rural areas where existing programs are relayed from distant stations which do not meet the needs of local programming.

Cable Television

Cable television is a communication system that distributes broadcast television signals by means of a coaxial cable. Satellite and other electronic signals can also be transmitted along the cable. The additional non-video signals can be FM radio, subsidiary communication (SCA) signals and data transmission signals.

In the early development of cable television, six and twelve channel systems were developed. The systems that are being developed in 1983 have twenty or more channels, with some of the larger systems offering fifty-four channels or multiples of fifty-four (Cooney, 1983; California Public Broadcasting Commission, 1983).

Cable systems have a control center, termed headend, that is generally located at the site where signals are received. Signals received via antenna or earth station dish are amplified, filtered or converted as necessary. The signals then move over the cable to a hub site where certain signal processors are located prior to being distributed on the cable. Along the cable as it is distributed throughout the community are amplifiers. The number of channels of a cable determine the spacing of the amplifiers. The maximum number of amplifiers that can be used on a single cable is thirty because the video quality beyond that point is lost. The amplifiers can incorporate electronic filters or blocks which prevent the transmission of certain signals and allow other signals to pass.

Cable systems are authorized by local governments in incorporated areas and by county governments in unincorporated areas. The franchise operational agreements of cable companies specify channel capacity and may include specific channel capacity, as well as specific designations for governmental education and community access channels. Those systems that were constructed early had limited channel capacity, six to twelve, due to the developmental stage of the technology. Many of these systems are undergoing a refranchising process as their initial 15-year franchise expires. With the refranchising process, many cable system operators are improving their systems by expanding channel capacity and adding new technology options. As the technology and capacity expand cable personnel state that education will have to develop the way to use the technology and be prepared to exercise administrative control (Goddard, 1983).

When many initial cable franchises were negotiated and in most refranchising agreements, cable companies are including institutional loops in their systems. An institutional cable loop may be a separate cable connecting schools, post-secondary institutions and governmental facilities, or it may be a number of dedicated channels on the subscriber cable that are electronically blocked from being received by the subscriber.

The institutional loop can consist of a single channel or multiple channels with transmission from the headend and in most systems transmission from sites on the loop. An institutional loop has the capacity to send and receive video signals and computer data

between sites and within a single institution. The Irvine Unified School District and the University of California at Irvine have been using an institutional loop that has thirty-one access sites, including elementary and secondary schools, University of California at Irvine, Irvine City Hall and the local library (Peterson and Burge 1982; CPEC 1981). Two channels are used that have been designated for two-way transmission.

When this system is in operation, any school can originate a signal and transmit it to any other school or groups of schools. The system becomes interactive because any site on the line can interrupt the signal and indicate that they want to come on the cable and ask or respond to questions. Austin Community College, Austin, Texas has established an institutional loop and in the fall of 1982 was planning to expand their loop to include businesses in the community (Groves, Reid, Brey, 1981).

As cable system operators expand existing services and develop new services, one of the major activities that may be undertaken is system interconnections. While cable system operators see cable interconnections as providing larger markets and increased advertising revenue, educators can see opportunities to expand educational programming. The first large regional cable interconnection network was developed by Grill Cable of San Jose, California in 1979. In 1982 and expanded interconnection system was announced by Gill Cable and Viacom Cable to form the Bay Area Interconnect (CPBC, 1983). The cable industry recognizes that system interconnections are necessary if cable systems are to offer other

services in addition to the traditional television.

The current state of cable television is principally a one-way system. This one-way or downstream use is the way in which educators are currently using cable television. The designation one-way means that the cable signal is transmitted from the cable headend to the subscriber. Educational institutions frequently utilize cable technology for broadcasting instructional materials because more channels are usually accessible at much lower cost than broadcast television.

Interactive cable television has been used since the mid-1970's. As the cable system operators refranchise, many communities are considering interactive services as an option. These services are not expected to be fully developed until the end of the decade, when the industry will be economically driven to offer them (Goddard, 1983). Two examples of interactive cable television are QUBE AND Hi-OVIS (Ruffles, 1982; Toffler, 1980).

QUBE was installed in Columbus, Ohio in 1977 by Warner-Amex Cable Communications. This system involves thirty channels providing entertainment, information and education. The subscriber is provided with a small microcomputer terminal and channel selector. Of the thirty channels, three have been dedicated for educational programming. One of these channels provides programming for postsecondary courses from local higher education institutions. The viewer can communicate with a central college computer through their home device. The computer summarizes the student responses for the faculty. The QUBE system does not have an audio-interactive

capacity.

Hi-OVIS is a system that involves the use of computers, optical transmission cables and home audiovisual terminals. This system was installed in Japan in the community of Higashi Ikoma. The system is designed to permit every subscriber the capability of transmitting audio and visual signals to anywhere on the system. One of the purposes of the system was "...to provide increased opportunities for lifelong education" (Ruggles, 1982:10). The system has the potential for achieving a complete interactive communication between a faculty member and students viewing at a distant site.

A number of other interactive cable television projects have been initiated. One project undertaken in Spartenburg, South Carolina by the Rand Corporation used live two-way programming over the local cable television system (Lewis, 1983). Students responded and interacted by using the telephone and simple data terminals. An experimental project by Michigan State University in Rockford, Illinois used a minicomputer to control the students' interaction with twelve videotaped lessons. The students had a special computer terminal which they used to respond to quizzes. The central minicomputer summarized the quiz responses and displayed them on the screen as the lesson continued.

Two different attempts at interactive cable television occurred in Reading, Pennsylvania and at South Oklahoma City Junior College. In Reading, a split screen video system permitted individuals who came to specific sites to have two-way audio and video, whereas those individuals on the cable but not at the specific sites could view the

program and interact with the participants by using their telephone. South Oklahoma City Junior College uses the telephone to provide the interaction between the student and faculty member (DeChenne, 1980).

Cable experts state that cable television has had tremendous transmission capacity from the headend but limited transmission capacity from sites on the cable. In the future, however, telephone communication may be the means for interactive cable television because of the increase of personal home computers (Goddard, 1983). A home computer can be interfaced with the telephone, which is connected to another computer at the headend of system. This central computer could record student responses. The central computer could also respond to requests of the home computer for a specific program to be broadcast over the home television. The home computer and personal telephone could also interact with a central computer at the educational institution, thereby storing the students' responses. The advantage of using the telephone system for response transmission is that a cable television system does not have the complex switching capability of a standard telephone network, and thus it would not be able to handle a large caller response load.

Two additional technologies that can use either a telephone line or a cable television system for transmission are teletext and videotex. Teletext is a one-way transmission of information in the "blanking interval" between frames on a television channel. The blanking interval appears as a black bar on poorly adjusted television sets. If a picture is rolling or flopping over, the space between the frames is the blanking interval. Teletext signals are

transmitted along with regular television programming.

The first widespread use of teletex was with closed captioning so deaf viewers could follow a television show (Hecht, 1983). To receive teletext signals requires a special decoder that is attached to the television set. A viewer selects a teletext page by typing a code number on a special keypad on the decoder. Teletext has limitations when it comes to the number of pages available, amount of information in the display, and the time it takes to display the page. To increase any one of the three factors (number of pages, amount of information or waiting time) requires changes in one or both of the other factors. The changes usually result in reduction of service.

Videotex is a two-way system that will transmit only information that is requested. Because videotex is a viewer request system, the data base is much larger than teletext. The system involves a decoder and special keyboard microprocessor connected to the home television set. Using the special keyboard of the microprocessor, a viewer requests information. The signal travels over the cable to the videotex system's computer, which retrieves the specified information and transmits an encoded signal downstream to the decoder. The decoded signal is displayed on the television screen.

In addition to having a larger data base, videotex also has the capacity to generate graphics, which the teletext system cannot do. Four graphic videotex systems have been developed: the British Prestel system, the Canadian Telidon system, the French Antiope

system and the Japanese Captain system. In the United States, experiments using videotex graphics have been conducted in Ridgewood, New Jersey by American Telephone and Telegraph and Columbia Broadcasting System and in Coral Gables, Florida by the Knight-Ridder newspaper chain (Ruggles, 1982; Hecht, 1983). Knight-Ridder have been so encouraged by the experiment that they are planning to expand the service nationally in the mid 1980's.

Videotex has been primarily business-oriented in its early uses, with limited experimentation in education. In the province of British Columbia, three institutions are involved in experimenting with videotex to provide information on services and courses available at the institutions (Ruggles, 1982). In California, the public broadcasting station KCET-TV in Los Angeles has experimented with the French Antiope systems (CPEC, 1981). California State University at San Francisco is using videotex as an information service to 65,000 subscribers of Viacom cable in San Francisco.

In videotex, the telephone is used to activate the service, which is then broadcast on the cable. The viewer follows instructions on the television screen, dials and then hangs up. An index with the caller's code number appears on the screen. The viewer then selects a response or request from the index and dials the appropriate code number. The selection then appears on the screen. The use of the telephone in this type of upstream interaction is unique and inexpensive when compared with the cost of a decoder needed for teletext transmissions. Videotex has some drawbacks, such as the interruption of text service when another

viewer dials in and everyone on the cable can see what is requested. However, videotex has a high potential for educational use because it can integrate text material with graphics, and because it permits the learner to access the information when it is convenient and to communicate with the instructor when needed.

Instructional Television Fixed Service (ITFS)

Instructional Television Fixed Service, ITFS, is a form of microwave transmission in a very narrow band, 2500 to 2690 megahertz, that is used in a line-of-sight transmission. In 1963 the Federal Communications Commission established ITFS and set aside thirty-one channels for educational, medical and other non-commercial purposes. In 1971 the number of channels was reduced to twenty-eight; three channels were assigned to Operational Fixed Service for use by business and commercial interests. The remaining twenty-eight ITFS channels are divided into seven groups, (A-G) of four channels each. Low power transmitters with a range of thirty miles can broadcast up to four channels of video to specific locations, which must be equipped with special antennas and down converters. Down converters are the electronic devices that change the high frequency microwave signal into one that can be received by a conventional television set.

Instructional Television Fixed Service can be operated in two different modes: one mode has one-way video and two-way audio; the second mode is two-way video and audio. A 1980 study (Curtis and Blatecky, 1980) reported that there were eighty-two ITFS systems with a total of 492 channels operating in the United States and that nine

systems with 105 channels had applications pending with the Federal Communication Commission.

Stanford University began in late 1960's to use a one-way video and two-way audio ITFS system to deliver instruction to over eighty classrooms in industrial and governmental organizations (Morris, et al, 1975). This talk-back audio transmission uses a four megahertz frequency at the upper limit of the ITFS band. Live instruction from two campus classroom studios is televised to the off-campus sites. Participants at the sites view and hear the instruction live and are able to respond to questions and enter into discussions with the instructor through a microphone and transmitter at their site (Pettit and Grace, 1970). To achieve the interactive audio portion of one-way video and two-way audio, most institutions use the telephone. The use of the telephone greatly reduces the cost of an operation because the need for additional talk back transmitters (one at each site) and receivers is eliminated.

A two-way audio and video system was developed in 1973 for the Metropolitan Regional Council, a voluntary association of local governments in New Jersey, Connecticut and New York. In order to accommodate a ten-site interactive audio and video teleconferencing format, three ITFS channels (H1, 2 and 3) were used for the transmission to master control. A band frequency that had been previously set aside by the FCC for industrial, medical and scientific use was developed for transmissions from master control. By using other microwave frequencies, the Metropolitan Regional Council has achieved a two-way audio and visual interactive system

(Morris et al, 1975).

Each segment of higher education in California is developing or using ITFS. Eight community colleges, three California State University campuses and four campuses of the University of California are currently operating ITFS systems. The community college systems are used primarily to transmit signals to cable systems headends with transmission to off-campus centers of secondary importance. This is in contrast to the California state universities and colleges where their primary use of ITFS is to broadcast to distant learning centers and a secondary use is to reach cable system headends. The four University of California campuses also use ITFS to transmit to distant learning centers. The California State University and College system proposed a statewide interconnection system in 1979. The proposed system has not been developed; however, elements have been implemented. Regional networks are developing in the Los Angeles Basin and San Francisco Bay areas. An ITFS and microwave network extends from California State University at Chico to California State University at Bakersfield a distance of 341 miles.

Two of the most extensive uses of ITFS are the San Diego County Department of Education in California and the Catholic Archdiocese of San Francisco. The San Diego county system uses six channel groups for a total of twenty-four channels to serve over 400 sites representing more than 88 percent of all public schools and 97 percent of all the students of the county (CPBC, 1983). The Archdiocese of San Francisco operates five channel groups, which include twenty channels, to provide services to 130 schools and 50

other sites. Another extensive ITFS system is operated in Richardson, Texas, where over 180,000 students in more than 200 schools are served (Curtis and Blatecky, 1980).

Instructional Television Fixed Service is a very cost effective broadcast medium. Curtis and Blatecky (1980) reported the results of a survey which show that the cost of broadcast time for educational institutions ranged from $17.41 to $58.94 per hour, which compared favorably with the CPBC (1983) report of $13 to $38 per hour for the San Diego County Department of Education. These costs are well below the $185 per hour costs of broadcast time on public television.

Instructional Television Fixed Service has special features that make its use by higher educational institutions attractive. The features are low cost interactive capability and flexibility in broadcasting to meet the needs of different learners and institutions.

Microwave

Microwaves are a broad band of ultrahigh frequencies from about 1000 megahertz upward. Microwave transmissions are a point-to-point line-of-sight with relays being used to extend the range beyond the line-of-sight termination. Microwave is capable of broadcasting both video and audio signals.

California State University at Chico uses microwave in addition to ITFS to reach learning centers that have been established in significant population centers north of Sacramento. Not only are

courses broadcast over the network, but computers in certain centers can also access the university library's on-line bibliographic service through the ITFS system.

The TAGER network of the Association for higher Education of North Texas is reported to be the largest closed circuit microwave higher education network in the United States (Lewis, 1983). Ten of the seventeen members of the association participate in the network. Point-to-point microwave connects the participating institutions through TAGER's master control, and the connection to business and industry facilities is by ITFS.

The University of California recently completed a study (CPBC, 1983) on its future uses of telecommunications in which a microwave system is proposed that will connect all U.C. campuses for voice and data service.

Kirkwood Community College of Cedar Rapids, Iowa uses a microwave link to connect the main campus with seven outreach centers. Each link is capable of carrying audio and color video in both directions. Any of the seven sites can be connected independently to any other site or group of sites (Gross, 1983).

Microwave technologies have not been used, with the exception of the ITFS band, to their greatest potential by higher educational institutions. Microwave has been used most often in the private and public sectors to carry or relay voice, telemetering, facsimile and digital communications. If the Federal Communications Commission significantly changes their regulatory policies for ITFS, higher education institutions in many instances will have to use microwave

frequencies to maintain their broadcasting capability.

Slow-Scan Television

Slow-scan television, also termed freeze-frame television, is a technology that can transmit still pictures accompanied by an audio signal. This process can be accomplished in any one of three ways: on regular telephone systems, which is the usual method used; by microwave; or by using SCA of FM radio. The technology involves reducing the complex wide-band television signal to a size that permits it to fit audio channels. Depending on the picture detail required and the channel used, it can take anywhere from 10 to 78 seconds to transmit a single image. This compares to the 25 to 30 pictures per second transmitted by conventional television. At the reception point, a video expander restores the signal to the normal bandwidth for imaging on a standard television set.

In a study of seventy institutions, utilizing telecommunications as a means to deliver instruction, Lewis (1983) reported only three uses of slow-scan television. Rio Salado Community College indicates that they have recently begun to use slow-scan television to deliver instruction in conjunction with audio teleconferencing. The University of Wisconsin Extension uses slow-scan in their Statewide Extension Education Network, SEEN. In rural Maine, slow-scan television is being used to provide continuing education for medical professionals at five hospitals. In these three examples of slow-scan television, telephone lines are used to transmit the signals.

To this date there has been very limited use of slow-scan

television by higher education institutions. As institutions expand their telecommunications capabilities slow-scan television will be used more often because this form of transmission is a great deal less costly than regular television signals. The use of telephone lines to carry the signal means that it is not only cheaper to broadcast but also it can reach almost any site in a very large geographic area. When used in conjunction with satellite-based telephone services, slow-scan television will find greater application.

Satellite Television

In a communications satellite system, microwave signals are transmitted from one earth station, termed "uplink", to the satellite. The satellite then retransmits the signal back to another earth station, termed "downlink". The area on the earth that can receive a signal from a particular satellite is termed the "footprint", and anyone within that area with an earth station dish antenna can receive the signal. These links are used for all types of communication: radio and television signals, telephone, and data transmissions. Microwave frequencies between 300 megahertz and 30 gigahertz are used because these frequencies are subject to less interference and are not deflected to any appreciable amount by the earth's atmosphere.

Early satellites merely reflected ground signals back to earth as they circled the earth. Satellites that circle the earth once every twenty-four hours are called synchronous satellites. When the satellite is positioned above the equator at a distance of 22,600

miles, it will remain in a stationary orbit. Satellites in geostationary orbits are desired because earth antennas have to be set only once in order to provide constant contact. A typical satellite has twenty-four units called transponders that receive the earth signal, amplify it and retransmit it to a downlink. Usually one transponder can simultaneously carry two television signals or 980 different telephone signals.

The satellites currently in use are termed "low power satellites" because they transmit low power signals to earth. A large thirty-foot antenna is necessary to receive these signals. Medium power satellites are planned for 1983, and highpower direct broadcast satellites are proposed for 1986 (Bartlett, 1983; Luskin, 1980). These satellites will require smaller dish antenna, about two feet in diameter, which can be mounted almost anywhere as long as there is a clear line-of-sight to the geostationary satellite. These new developments hold potential for higher education institutions to establish educational networks that reach learners not currently being served.

The current use of satellite technology in higher education consists primarily of institutions that receive educational broadcasting from several programming sources such as Appalachian Community Service Network, Public Broadcasting Service and the National University Consortium. These programs are not interactive; however, interaction is possible with the use of the telephone. Higher education institutions that do use earth station downlinks are rebroadcasting the signal to learners via cable, ITFS or microwave.

Another use for satellites is in the area of teleconferencing. In recent years, the use of satellite technology for teleconferencing has been expanded by the introduction of consortia and networks that are designed specifically to meet lifelong learning and continuing education needs. The primary use to date of satellite teleconferencing by education has been information-sharing, where individuals in a studio share their knowledge and expertise to a TV audience who can ask questions via telephone from their locations. As these networks and consortia expand, there will be more use of satellite technologies to deliver interactive instructional programming (Bretz, 1983).

Electronic Blackboard

The electronic blackboard is a technology that permits the transmission of drawings and graphic material from one location to another, using telephone lines. The electronic blackboard developed by Bell Laboratories is a blackboard with a special pressure sensitive surface which converts chalk strokes into electronic signals (Baltzer, 1980). At the receiving site, the signals are electronically changed for viewing on a standard television monitor.

Where the electronic blackboard has been used, a second separate telephone line is used for audio communication. This telecommunications format has been used most often in situations where faculty and students need a visual way to transmit graphics. The University of Illinois at Urbana-Champaign uses the electronic blackboard to provide off-campus engineering and mathematics courses for employees of various industries (Lewis, 1983). Consumnes River

College in Sacramento, California, uses the electronic blackboard to deliver courses to inmates of Folsom State Prison. The inmates can interact with the faculty by using a separate telephone line (CEPC, 1981).

Another type of telewriting involves a pressure-sensitive electronic tablet that uses plain paper and a pen. The system can include two colors (red and green) and has the capacity to store up to fifteen pages of material. Recent technological advances in telewriting permit an interface with slow-scan video; audio cassettes can also be used to store graphic information. By adding a voice-bridge interface, multiple terminal hook-ups are possible, this permits an unlimited number of tablets to be used. Annotations can be made on most video telewriting systems due to the presence of the video interface.

This technology has not been fully developed or utilized by higher education institutions. Recent advances in telewriting technology will increase its use beyond that of symbolic or graphic information which accompanies a lecture.

Videodisc

The technology of a videodisc systems involves the conversion of video and audio signals to digital signals, which are then recorded on a videodisc. The videodisc is placed in a videodisc player where the recorded digital signal is reconverted into video and audio signals that are then transmitted to a television set. A videodisc has the capacity to store 108,000 single frames per side; in addition, there are two audio channels as well as closed-caption

capability. Most programming for educational and industrial use is produced in a 54,000 frame-per-side format in order to take advantage of still frames. The capability of videodisc players to interface with a microcomputer produces a system that is ideal for interactive individualized instruction.

Videodiscs are produced in two formats which determine the type of player that must be used. The two formats are a capacitance electronic system and a laser-based optical system. In the capacitance electronic system, a stylus electrode picks up information from the disc in the form of variation in the capacitance between the electrode and disc surface. The video and audio information has been encoded on the disc as microscopic pits. In one system of capacitance developed by JVC, Victor Company of Japan, the stylus never makes actual contact with the disc. In a second type of capacitance system developed by RCA, Radio Corporation of America, the stylus is in direct contact with the surface and pits of the disc (Nugent, 1980).

The laser-based videodisc system uses a laser beam optical system to read the disc. Two types of laser systems have been developed. One system has the laser beam reflected off the surface of the disc to a detector. The other has the laser passing through a transparent disc to a detector on the other side. The reflectance system reads only one side of the disc whereas the transmissive disc can read both sides of the disc, depending on the focus of the laser.

One feature of videodisc technology is the ability to display

still frames and have random access to individual frames. The RCA capacitance disc and its player lack this capability. The capacitance systems developed by JVC has both these features. The optical videodisc systems have each frame numbered and any frame or series of frames can be randomly accessed either as stillframes or as motion. The educational or industrial optical disc players have built-in microprocessors that can recognize special codes that are read off the disc or entered through a keypad. This built-in microprocessor permits a limited number of functions to be carried out. To expand its versatility, the player can be interfaced with a microcomputer. Other features of the videodisc player may include variable speed, forward and reverse, individual frame search, and response to preprogrammed coded signals on the disc for specifications such as picture stops and chapter stops.

Both the capacitance and optical videodisc systems appear to have great educational potential. Those players that incorporate microprocessors and microcomputers could become very sophisticated individualized interactive learning systems. However, there is currently a lack of videodisc educational programming, but as more programs are produced the technology will improve and the cost of systems and disc production will be reduced.

COORDINATED AND INTEGRATED TELECOMMUNICATION SYSTEMS THAT ARE BEING USED BY EDUCATIONAL INSTITUTIONS, THE MILITARY AND INDUSTRY IN THE UNITED STATES AND OTHER COUNTRIES

Administrative staff at four community colleges were interviewed and the telecommunications facilities were observed

during a one-year period between July 1982 and May 1983. The following three community colleges were studied because each one was involved in using or developing more than one type of telecommunication system: Palomar College, San Marcos, California; DeAnza College, Cupertino, California; Evergreen Valley College, San Jose, California; Los Rios Community College District, Sacramento, California.

During the same period, extensive discussions were held with administrators of Maricopa Community College District in Phoenix, Arizona and Kirkwood Community College in Cedar Rapids, Iowa, on their current and planned use of telecommunications. The director of Association for Continuing Education was interviewed about the operation of the association's ITFS system. The college administrators at each location were asked: (1) what kind of telecommunication technologies were being used; (2) what kind of instructional uses were being made of the different technologies; (3) what future planning was being done; (4) how were the faculty involved in the use of telecommunications technology.

In addition to these interviews a review of the literature was conducted to obtain information about other educational institutions that used multiple telecommunication systems in an integrated and coordinated manner. Thirteen organizations that used multiple communications systems were reviewed: seven higher education institutions, four higher education consortia, one professional and one non-profit organization.

The uses of telecommunications by industry, the military and other countries was determined by a literature search and review. The review showed that ten countries were using telecommunications in unique ways to reach distant learners. Through interviews with representatives of the United States Army and a search of the literature, a limited amount of information was obtained on military uses of telecommunications.

Information in the following sections is a result of on-site visits and literature research. The sections describe telecommunications activity in American higher education, industry, the military and in foreign countries.

Higher Education Institutions

Many educational institutions and associations have developed and presently use telecommunication systems. The telecommunication activities of four community colleges, two community college districts and one education association are described in the following section. This analysis and review of higher education's use of telecommunication technologies is focused on institutions that are currently utilizing several technologies in an integrated manner. Luskin (1981:60) reports that more than "...600 American colleges now broadcast...using cable, commercial stations and stations of the Public Broadcasting Service." Seventy programs using telecommunications were reported by Lewis (1983). These seventy programs represent 385 separate institutions. The large number of institutions using telecommunications to provide learning opportunities is an indication that higher education recognizes the

increasing importance of the medium as a delivery medium.

Palomar College

Palomar College is located in San Marcos, California and serves an area in northern San Diego County that includes the communities of Escondido, Fallbrook, San Marcos and the Camp Pendleton Marine base. The distance of the communities from the college varies from a few miles to a distance greater than twenty-five miles.

Prior to 1980, Palomar College, offered consortium telecourses as a member of the San Diego Television College Consortium. These courses were offered by the Consortium over a cable network distribution system that utilized ITFS to connect to ten cable systems. In 1980, the college completed the development of a television studio and an ITFS transmission facility. At the same time, Palomar College was negotiating with two of the three local cable television companies for use of a cable channel to broadcast college-produced telecourses and to rebroadcast consortium telecourses. All of Palomar's courses, college produced and consortium rebroadcasts, were delivered to cable company headends via ITFS. The college was broadcasting between thirty-two and thirty-six hours per week in the fall of 1980.

In the spring of 1981, one of the cable companies informed the college that it was reducing the amount of hours available for college use in the 1981-1982 year. As a consequence of reduced cable time, the college has been broadcasting only four regularly scheduled college courses; the rebroadcasting of consortium courses has been eliminated. The cable company has offered the college access to a

channel in the pay for view tier of channels which could reduce the number of individuals who could be reached by television.

In 1980, Palomar College began to broadcast campus classes via ITFS. These classes are broadcast to the United States Marine Corps base at Camp Pendleton and to selected schools in San Diego County. When the classes are broadcast through the cable system, the signal is transmitted to the cable headend by ITFS.

The college completed construction of a television studio facility in 1980. This studio enables the college to originate programs and produce telecourses. The college has adopted a unique procedure for their telecourse production. The courses goes through a preproduction planning period during which the faculty details each telecourse lesson. When the course is broadcast, it is transmitted live and distributed to cable headends and the Camp Pendleton learning site by ITFS. The unique part of the program is that the instructor has a live studio audience of students who are enrolled in the course. The administration and faculty believe that the presence of students in the studio has been beneficial in that the students provide an interaction that is lacking when courses are televised in the absence of students. The course is also videotaped for rebroadcasting later in the week and in subsequent semesters.

The faculty are involved in the selection of the Consortium telecourses and in the development of college-produced courses. The instructor for each course hold an orientation at the beginning of each semester for students enrolled in television courses. Throughout the semester, telecourse students participate in four to

five on-campus seminars and examination meetings.

Palomar College plans to expand its cable broadcasting capability as channel time becomes available. In the interim, the college is expanding its ITFS links to provide college courses live to local industries. These courses will include a two-way interactive communication link between the instructor and students. The college is also investigating the feasibility of a low-power television station to serve remote segments of the district. The college also is negotiating to have one of the local cable companies tape specific programs received via satellite. This is not the ideal way for Palomar College to receive satellite transmission; however, it can meet their immediate needs.

The main problem Palomar College has is the availability of channel access. The reduction of available hours points out the problem of not having a dedicated educational channel for the exclusive use of the college. The college's case for needing a dedicated channel is weakened by two of the three cable companies having channels already dedicated to the San Diego Television College Consortium. If the college can obtain either a dedicated channel or specific broadcast hours from the three cable companies, it will be able to offer educational opportunities to a large number of learners in remote areas of the district.

DeAnza College

DeAnza College is one of the two colleges that comprise the Foothill DeAnza Community College District. The college, located in Cupertino, California serves the cities of Cupertino, Sunnyvale,

Santa Clara, Los Altos and Los Altos Hills in Santa Clara County. The area served by the college is a high technology center, called "Silicon Valley", which has been one of the fastest growing population areas in the state.

Telecommunications opportunities for DeAnza College and the Foothill-DeAnza Community College District began to open up in 1982. Two cities in the district, Mountain View and Cupertino, awarded cable television franchises after a very competitive corporate bidding. As a result of the cable competition, the successful cable companies will help each college modify existing telecommunication facilities or construct new facilities, purchase equipment and provide dedicated channels. DeAnza College will also receive a special grant to cover the cost of a half-time coordinator of community cable programming for fifteen years.

DeAnza College entered into an agreement with United Cable of Cupertino and the city of Cupertino. United Cable installed a fully equipped professional color production campus studio for community programming. The cable company also agreed to maintain and service the facility that will be operated for and by college staff. United also installed and is operating two satellite downlinks and a television tower on the campus. This equipment is also being used to receive teleconferences, television workshops, telecourses and other special programming requests by the college and other public agencies in the city of Cupertino.

The agreement provided for two cable systems in Cupertino. The

first system provides the regular cable service, including the pay services. This system includes five channels that have been set aside for community (1), government (1), public access (1) and education (2). The second cable system forms an institutional network connecting DeAnza College and its library with the Cupertino Public Library, Cupertino City Hall, three high schools and one elementary school. It is anticipated that additional community agencies will be connected to the system in the near future. This second system is bi-directional, with twenty-one channels downstream and seventeen channels upstream. The system is able to transmit video, computer data, radio messages, and teletex.

A major element in the franchise agreement was that United Cable of Cupertino would assist in interconnections of its system's educational channels with educational channels of adjoining cable franchise areas. The interconnections require extensive joint power agreements among the franchising bodies. The final negotiations of the joint power agreements were undertaken in May of 1983. When the interconnections are completed, DeAnza College will provide educational programming to the cities of Santa Clara, Los Gatos, Sunnyvale, Los Altos, Los Altos Hills, Mountain View, Palo Alto, Menlo Park and Stanford.

Another development will provide for a microwave transmissions between DeAnza College and Gill Cable of San Jose. The microwave will be two-way and will include Evergreen College in its transmission path. Gill Cable has agreed to provide three channels for educational use.

Currently DeAnza College is broadcasting telecourses on cable television in the cities of Cupertino, Sunnyvale and Mountain View. The college is a member of the Bay Area Community College Television Consortium, and as a member includes the consortium telecourses in their instructional schedule. The telecourses are also shown on closed circuit television on the campus and in the college's open media laboratory. The college has established on its cable channel a unique feature called "select-a-show", which permits students to request the reshowing of a telecourse lesson at specific times scheduled throughout the week.

In the fall of 1983 DeAnza is planning to begin broadcasting on FM radio. A non-profit organization with a 200 watt FM radio license will move onto the campus. The college will provide operations staff and in return will be able to use air time during each day. The college has an application on file with the Federal Communications Commission for a low-power television license which would permit it to begin the development of a low-power television station.

The faculty at DeAnza College are involved in the selection of telecourses for broadcasting each semester. They are also involved in the use of the college studios for the production of programs. With future telecommunication expansion planned for DeAnza and Foothill Colleges, the faculty will be more involved in using of telecommunications to instruct and communicate with students.

Evergreen Valley College

Evergreen Valley College is one of two colleges in the San

Jose Community College District, San Jose, California. The college, on the southeastern edge of the city, is located in a rural area that is rapidly being replaced by housing developments.

The college has a well-equipped television production studio which is used to produce college public service announcements, a public information program, and recently a telecourse. The studio is able to broadcast close circuit programs to the college, but programs and public service announcements usually are videotaped and delivered to Gill Cable of San Jose and Teleprompter of Milpitas for broadcasting.

The college has plans to develop microwave linkages with Gill Cable and DeAnza College. The linkage will be two-way, permitting the college to originate and receive transmissions. With the microwave link to DeAnza College, Evergreen Valley College will be able to expand the number of course offerings and public service and information broadcasts. Discussions now taking place between Evergreen Valley College and DeAnza College may lead to the formation of a telecommunication learning consortium that would include two four-year institutions and two more community colleges.

As a member of the Bay Area Community College Television Consortium, Evergreen Valley College's faculty are actively involved in the selection of telecourses that the consortium broadcasts. It is anticipated that the faculty will become more active in the use of telecommunications as the college expands its involvement.

Los Rios Community College District

The Los Rios Community College District includes three colleges: American River College, Sacramento City College and Consumnes River College. The district encompasses all of Sacramento County and part of El Dorado County.

The Los Rios District's activity in instructional telecommunications began in 1973 with the Television Consortium of the Valley Colleges. The consortium would select telecourses for broadcasting, using both commercial and public stations. During the past three years, between thirty and fifty-seven percent of the consortium's enrollments have been from the Los Rios District.

In the winter of 1982, the District formed a telecommunications task force to review the state of cable franchising in the city and county of Sacramento, and to determine how the various corporate franchise applications and the technologies they proposed might be used in programs and services offered or planned by the Los Rios District. The county superintendent of schools formed a Sacramento County Educational Cable Consortium to develop statements as to the uses of cable television relative to educational needs. The two activities resulted in the formation of a non-profit corporation, the Sacramento County Corporation for Educational Telecommunications. The consortium consists of: the county schools office; every school district in the county; the University of California at Davis, California State University at Sacramento; McGeorge School of Law; Catholic Archdiocese; public libraries, city and county systems; and

the Los Rios Community College District.

Late in 1982, a franchise which covered the entire county was awarded to the United Tribune Cable Company. The franchise contract included the most extensive educational and community grants program ever awarded to an educational community by a cable company. A summary of the educational grant shows that the three community colleges would each have a 2400 square foot studio constructed that would have total communications capability. These studios will also serve as public origination studios and be staffed by United Tribune. The studios will be for consortium use and will feed into an institutional loop that will connect all elementary, junior and senior high schools, as well as all the higher education institutions. This loop will have two-way capability. The cable company also provided four educational cable channels on the subscriber tiers and agreed to completely cable-connect every school in the county. Rural schools would be included through the use of an ITFS system. In addition, the company agreed to contribute between $2,161,000 and $3,500,000 in new equipment, maintenance, insurance and studio operations over the fifteen-year term of the franchise. A detailed analysis of the educational grant is listed in Appendix C.

The Los Rios District is actively planning for the use of cable television and other telecommunications. They have applied for a low-power television license and are beginning to work with the San Juan Unified School District of Sacramento in the operation of KYDS, an FM radio station. Joint plans include the development of a tutorial radio format. It is anticipated that the Los Rios District

could begin broadcasting on cable late in Fall 1983. Planning is taking place on additional uses that the institutional cable loop can accommodate.

The faculty of the Los Rios District have been actively involved in the selection of telecourses that are broadcast by the Television Consortium of the Valley Colleges. When the district formed a Telecommunications Task Force in 1982, the faculty were involved. The faculty and administrative staff were also involved in a series of 1983 workshops that focused on the future uses of cable and other telecommunications. Plans are underway for the development of six classes to be broadcast on cable late in 1983.

Future relationships between the cable company and the educational community in Sacramento County are uncertain at this time. After more than nine months of negotiations on the final contract agreement and prior to signing the agreement with the County Board of Supervisors, United Tribune Cable Company withdrew their franchise application. Negotiations are being continued, and despite this uncertainty the plans that have been developed and the potential commitment of United Tribune Cable Company can serve as a model for a very sophisticated educational telecommunications network that would be a valuable educational resource now and in the future, for Sacramento and other communities.

Association for Continuing Education

The Association for Continuing Education was founded in 1968 as a non-profit organization by industry, government organizations and Stanford University to develop and deliver credit and noncredit

courses and programs to individuals at their employment sites. The Association uses the Stanford Instructional Television Network's ITFS system and facilities. The courses and programs are broadcast live and are two-way, using the second ITFS audio channel or a telephone for students to interact with the faculty. The ITFS system reaches sixty different sites in the greater San Francisco Bay area. At each site the business or governmental agency has acquired the proper ITFS receiver and audio transmitter. Courses are broadcast from four studios on the Stanford campus. The studios have been designed as classrooms, with a monitor and microphone provided for every two students. The students in the classroom/studios interact with the instructor by activating their microphones, which enables all students to hear the question and response.

The Association uses the Stanford ITFS systems before 9 am, between noon and 1 pm, and from 4 pm or 5 pm to 7:30 pm. Both credit and non-credit courses are broadcast. Because the Association for Continuing Education is not an accredited institution, it grants college credit through its relationships with several higher education institutions. The courses offered cover a wide range of topics, from special management and supervisory courses to general interest topics such as home cash management. An MBA program that can be completed in two years is offered through Golden Gate University.

The Association and Stanford severed their fifteen-year relationship in 1983 primarily because Stanford wanted to use its ITFS channels for its on programming. The Association has negotiated

the lease of a building on the Foothill College campus, where they will build four classroom studios. An application for four ITFS channels has been filed with the Federal Communications Commission. The number of businesses and governmental agencies has expanded to more than forty with the addition of local municipal governments and representatives of the banking industry (Beers, 1983).

The instructors used in the Association's program are all part-time faculty who are experienced practitioners in their professional fields. The live broadcast of courses and the two-way student interaction results in greater faculty involvement than in regular telecourses.

Kirkwood Community College

Kirkwood Community College is located in Cedar Rapids, Iowa and serves a seven-county area covering 4500 square miles with a population of approximately 350,000.

Kirkwood Community College has developed a telecommunication system that provides for interactive capability. The system includes: (1) an interactive microwave network interconnecting eight locations; (2) an ITFS system with four main channels at the campus and six additional channels at various repeater/transmitter sites located in the surrounding six counties; (3) two educational access channels; (4) four classrooms on campus, four classrooms located in community learning centers and space in three high schools, and with the capability of originating live broadcasts for ITFS or cable transmission; (5) a telecommunications control center; and (6) a 10,000 watt public radio station, KCCK-FM. On campus there is a full

color television facility and a thirty-six channel closed circuit cable system.

The college broadcasts more than 350 programs per day on the campus closed circuit cable. The radio station broadcasts eighteen hours a day, seven days a week. The programming varies, including a range of topics from jazz to drama and children's material. The microwave and ITFS systems deliver more than ninety hours of credit programming, most of it live, interactive instruction. The two cable channels are programmed by Kirkwood Community College fifteen hours a day, the hours after 10 pm are used for a billboard until 7 am. The live cable classes are interactive through the use of a telephone call-in system.

Kirkwood's future plans included expanding their interconnections to other cable systems. A remote-controlled earth station is planned for the purposes of teleconferencing and obtaining educational programming. Future plans for the microwave system includes carrying additional voice and data information.

The faculty are an integral part of the Kirkwood Community College use of telecommunications. The faculty are directly involved in the live broadcast of courses, interaction with students via microwave or telephone and in the development pre-recorded courses for broadcast.

Maricopa County Community College District

Maricopa County Community College District is comprised of seven separate colleges encompassing over 9200 square miles in central Arizona. Four of the district's colleges are located in

Phoenix, the district's principal city. Rio Salado Community College has been designated as the college that will manage the district's use of telecommunications for instruction.

Currently the college uses public and commercial television, cable television, slow-scan television, video cassettes, audio teleconferencing and audio cassettes to provide educational opportunities for distant learners. The college also operates a public broadcasting radio, KCMR-FM, and provides a reading service for the blind and print handicapped on the subcarrier band.

The district is planning to expand its audio teleconferencing capabilities and to investigate the use of ITFS to broadcast programs to cable companies headends. An ambitious proposal now being discussed by the top leadership of the district involves the acquisition of a satellite transponder for transmitting educational programs, teleconferencing and teletex. The acquisition of the transponder and its potential uses have not yet been fully explored.

The faculty are involved in the selection of the courses, and in some instances they are involved in the course design. Interaction with students is in the passive mode as the faculty are available for telephone calls during specific hours. The faculty also correspond on a regular basis with the students.

Additional Educational Telecommunication Programs

A literature review provided information on additional educational institution consortia and educational organizations that are using multiple telecommunication systems to deliver instruction to students. Table 1 shows the institutions, consortia and other

organizations and the multiple used they are making of the different telecommunications technologies.

Seven higher education institutions that used two or more telecommunications technologies were reviewed. Five of the seven institutions use open broadcast television, either commercial or public television, as the main telecommunications system. All of the seven institutions utilize cable television to expand their inservice area and the number of homes that receive their signal. Two of the higher education institutions use Instructional Television Fixed Service as a means to transmit a signal to cable system headends. Satellite reception used by two institutions provides programming that is fed to local cable systems. Only one institution, the University of South Carolina, used point-to-point microwave to transmit their signal to nineteen sites in the state.

The four consortia all use ITFS and two consortia use point-to-point microwave. In the two consortia that are using only ITFS, it is being used to transmit signals to the headends of cable companies. The Association for Higher Education of North Texas uses its point-to-point to connect the colleges of the network with the central master control. The ITFS channels are used to broadcast to various corporate facilities from the central master control. The Indiana Higher Education Telecommunication System is a statewide system which is managed by Indiana University and uses microwave, ITFS and point-to-point to connect more than 100 sites in 26 communities.

The two professional and non-professional organizations use different technologies. The American Diebetic Association has used

satellite transmissions to sites where the signal can be retransmitted to meeting rooms. Point-to-point microwave is used by the Central Maine Interactive Telecommunications System to reach rural regions. The system provides continuing education for medical professionals. Slow-scan television transmitted over telephone lines is used to link the system with five hospitals outside the central Maine area.

Industry

Telecommunication technologies are used very frequently by corporate training departments, particularly in recent years. Videotape and more recently videodisc are the principle corporate telecommunication training media. With the development of satellites and the possibility of obtaining broadcast time on different transponder channels, corporations are hoping to use satellite teleconferencing as a way to reach employees or customers. Recently, 113 companies were surveyed as to the development, production and utilization of audiovisual materials in their corporate training programs. The training videotape was the second most frequent medium used; it accounted for twenty-six percent of corporate expenditures for audiovisual training materials (Vaughan, 1981).

Several businesses now use teleconferencing for special or routine presentations and meetings. For example, a satellite teleconference was held in 1981 by Datapoint, a computer corporation that is in the field of communications. Datapoint utilized Holiday Inn's satellite teleconferencing capability. A new product was

TABLE 1

THE USE OF MULTIPLE TELECOMMUNICATIONS TECHNOLOGIES BY VARIOUS HIGHER EDUCATION INSTITUTIONS, HIGHER EDUCATION CONSORTIA, AND PROFESSIONAL AND NON-PROFIT ORGANIZATIONS

	Commercial TV	Public TV	Operates Public TV Station	ITFS	Point-to-Point	Cable TV	Satellite	Slow-Scan TV
Higher Education Institutions								
California State University, Chico				X		X		
Miami-Dade Community College	X	X				X		
Milwaukee Area Technical College			X			X		
Modesto Junior College						X	X	
Pennsylvania State University			X			X	X	
University of South Carolina		X			X	X		
Wayne State University		X		X		X		
Higher Education Consortia								
Association for Higher Education of North Texas (TAGER)				X	X	X	X	
Indiana Higher Education Telecommunications System				X	X	X		
San Diego and Imperial Counties Community College Association				X		X		
Southern California Consortium for Community College Television				X		X		
Professional and Non-profit Organizations								
American Dietetic Association		X		X		X	X	
Central Maine Interactive Telecommunications System					X			X

Adapted from Raymond J. Lewis, Meeting Learner's Needs Through Telecommunications, Washington, D. C.: American Association for Higher Education, 1983

demonstrated simultaneously to more than 10,000 individuals in twenty-three cities (Brudner, 1981). The Holiday Inn satellite network consists of 181 receiving stations in more than forty states.

Other examples using satellite teleconferencing includes the activities of TRW, Inc. and the Picher Corporation. TRW regularly used the teleconference format to communicate with staff across the country. Picher Corporation recently held a teleconference for their sales staff in thirty Holiday Inns across the nation (Brudner, 1981). The number of companies utilizing the teleconference as a means to provide training is estimated at more than 400, with another 2,500 companies showing interest in this the medium (Jenkins, 1983).

The use of videotape for corporate training is growing rapidly among large American Corporations (Menashian, 1981; Curran, 1981). Hewlett Packard has an extensive television facility which produces videotaped material on technical and product information for their staff and customers. Bell Laboratories use videotape for employee instruction in the specialized technological areas in which the company is involved. The Coca-Cola company uses twenty-six videocassettes in entry level and supervisory training. The videocassettes are used in an integrated individualized programmed training project that involves an audiocassette and work book.

International Business Machines is a high technology corporation that believes training is a fundamental element that strengthens the company. IBM divisions operate their own training programs. For example, Data Processing Division operates seventeen

regional and advanced education centers where customer, sales and system engineering training occurs. These centers use an individualized study program which incorporates the use of video, accompanied by study guide material (Dean, 1980). Computer-assisted instruction is used extensively for employee training but has limited application in customer training because of the lack of customer computerterminals for instruction.

To improve its corporate training program, the General Motors Corporation introduced the use of videodisc in 1979. The training program includes presentations on topics such as sales skills, sales development, new product orientation service and technical skills (Scott, 1982). Recently General Motors interfaced its training programs with a micro-computer to produce an interactive system for trainees (Lee, 1982). The Ford Motor Company began to switch its videotape training programs to interactive videodisc in 1982. The change to an interactive mode made it easier for employees to access information and reduced the complexity of training. Interactive videodiscs are also used to train employees of Los Alamos National Laboratory and Fireman's Fund Insurance Company (Broderick, 1982).

As businesses and industry increasingly recognize that they must maintain skilled work forces they will provide more training and education. Today hundreds of business are providing the training and education needed by their employees that was formerly received in higher education or acquired with on-the-job experience. In order to provide the training necessary to maintain a skilled work force business and industry are looking to interactive telecommunication

technologies to provide the medium for their programs.

Military

Various military departments have a long history of using audio-visual media and telecommunications activities in several training areas. Seventy-seven percent of all Department of Defense individual training and education was for new entrants into the services (Dougherty and O'Neil, 1978). The other twenty-three percent was training to improve existing skills. The military services have long used television as a medium to enhance their training activities (Kanner, et al, 1958 a,b; Kanner and Marshall, 1963). In the past five years, there has been a decrease in television and videotape training in the military due to the costs of producing programs. However, there has been a large increase in the development of computer-assisted-instruction (CAI) in the military services. The main CAI program developed and used by the military is based on using PLATO, a Control Data interactive system. The United States Navy has also developed a computer-managed instruction (CMI) system to diagnose the student's strengths and weaknesses and then prescribe instructional alternatives (Scanland, 1975).

As a result of an experiment to determine the effectiveness of using existing United States Army training materials in a videodisc format, the Army has actively explored the use of interactive video to meet its training needs (Holmgren, 1979). In addition simulation programs for a variety of training activities that use the interactive capability of the videodisc system are being developed

(Broderick, 1982). The Army is also using the interactive videodisc training systems for basic skills instruction, as well as technical instruction.

The military uses of telecommunication technologies in training has been primarily videotape. However, in recent year the uses of microcomputers for computer-assisted-instruction and to control videodisc systems are replacing videotape. The use of videodisc technology will increase as the cost of disc production is lowered because the technology offers an interactive capability not found in videotape.

Foreign Countries

Many educational projects in foreign countries have utilized satellite communications. Brazil, India and Indonesia use satellites for a variety of programs: primary and secondary education and teacher training in India; medical consultation and training in Brazil; and adult education in Indonesia. The University of the South Pacific at Suva, Fiji broadcasts educational programming to eleven Pacific nations spread over eleven million square miles of ocean. The programming provides continuing education for health care personnel and primary school teachers (Ruggles, 1982).

The use of educational television in the Peoples Republic of China is "...a truly functional teaching device... for 420,000 students enrolled" (Chu, 1982:51). The Chinese government has developed a Central Television University which offers technical and academic courses. The educational programming is broadcast over local television stations for two to three hours each day. Thirty

television universities throughout China offer the courses produced by the Central Television University, and they supplement these courses with their own educational programming to meet their local needs.

Japan has used television for educational purposes for many years. A two-way interactive system, Hi-OVIS (Highly Interactive Optical Visual Information System), was developed recently for the transmission of educational, advertising and public service programming. Hi-OVIS incorporates an optical fiber (instead of a coaxial cable) a keyboard, home TV camera and microphone. With the TV camera and microphone, every subscriber has complete two-way audio and video communication with the system's transmission centers. It is expected that Hi-OVIS in education will improve the quality of the learning experience because the instructor can see and hear the students and provide individual assistance (Murata, 1981).

In Ontario, Canada, Ryerson Open College uses radio to broadcast credit courses, and the Ontario Educational Communications Authority televises credit and non-credit courses in both English and French. The first Canadian Satellite began operation in 1973 and universities in the provinces of British Columbia, Newfoundland and Quebec have experimented since then with educational broadcasting (Ruggles, 1982). The first uses of satellite for educational purposes were one-way audio and video transmission. Televised instruction previously had been videotape or open broadcast. The first interactive university credit course offered in Canada

utilized the interactive communication satellite, Anik B, which permitted one-way video and two-way audio communication (Martin, 1981).

THE CURRENT STATE OF PERALTA COMMUNITY COLLEGE DISTRICT TELECOMMUNICATIONS AND THEIR POTENTIAL FOR EXPANSION

The Peralta Community College District is a large multicollege district with five colleges and a skills center: College of Alameda, Laney College, Merritt College, Vista College, Feather River College and the East Bay Skills Center. The District serves two distinct communities: rural Plumas County and the urban northern part of Alameda County. Feather River College is located in Plumas County and the other four colleges and skills center are located in the urban portion of the district.

A detailed review of the current state of telecommunications in the urban part of the Peralta District was undertaken and completed early in 1983. The District office and each college was studied, and an analysis was made of (1) the current use of telecommunications, (2) the condition of facilities, and (3) the potential for expansion. In addition, an inventory of telecommunications equipment at each college was made, and the condition of each piece was noted (see Appendix A).

The current state of telecommunications in the Peralta District is one in which there is a number of activities currently taking place that have a great deal of potential to produce an outstanding network. The telecommunications facilities at all of the colleges

need to be refurbished and re-equipped. The Laney College television facilities are the only facilities in the district that are operational.

Peralta Community College District

The Peralta District operates an educational cable channel, Channel S - PCTV, on Teleprompter of Oakland, the local cable company which supplies signals to the cities of Oakland, Piedmont and Emeryville. The District broadcasts forty-five hours a week. Broadcasts include telecourses, sports, theater, concerts, "C-Span" (live broadcast from the United States House of Representatives) and community affairs. A district owned earth station dish became operational, in 1982, but District staff have not yet used this dish to expand educational programming on PCTV.

The Peralta District was licensed to operate two ITFS channels in 1982. These channels were to provide a network for broadcasting specific courses and programs to selected sites in the district. The district has not purchased the necessary equipment, such as amplifiers, transmitters, antenna, receivers and converters, to begin ITFS broadcasting.

The District has been a member of the Bay Area Community College Television Consortium since 1974, and individual Peralta Colleges can take advantage of the consortium telecourses broadcast through commercial and public television stations. However, only one college in the District has consistently offered telecourses for credit.

The facilities for Peralta Television, PCTV, are located on the Laney College campus in the Theater Arts Building. They consist of five small rooms: master control, two small offices and a small videotape library on one floor and a larger staff office on another floor. The earth station dish is located on the southwest side of the Laney campus near the "G" Building. The dish is connected via cable to PCTV master control.

The cable programs are transmitted via cable from master control to the Teleprompter facilities and then broadcasted over the cable system. When PCTV schedules live broadcasts, arrangements must be made with the Laney College Media Communications Department to use a color television studio and control room.

The overall administration of Peralta Television is by a Director of Telecommunications who reports to the Vice Chancellor for Educational Services. A station manager, who reports to the Director, has responsibility for the day-to-day operation of PCTV and supervision of the station staff. The Director and the station manager work with representatives of the colleges in determining which telecourses will be broadcast and their broadcasting schedules.

Peralta's districtwide telecommunications activities are minimal by some standards and advanced by other standards. The various pieces and activities are not coordinated, nor is there a plan for their future integration. There is a great potential for the expansion of telecommunications and the use of PCTV in the

District.

College of Alameda

The college is located on sixty-two acres in the northern part of the city of Alameda. The college enrolled 6,088 students, 1,862 full-time and 4,226 part-time, in the Spring Semester of 1983.

The current use of telecommunications at the College of Alameda is limited to broadcasting specific programs to classrooms over a closed circuit cable system. If specific programs are requested from commercial or public television broadcasts, they are recorded and distributed over the closed circuit system. The college has not been an active participant in the Bay Area Television Consortium since 1977.

The College's Learning Resources Center houses the audio-visual center and television facilities. The television facilities consist of a 784-square-foot studio, master control room, film chain room and storage area where equipment and materials are stored and repaired. A smaller 336-square-foot studio, control room and office are located in a separate classroom building

Both television facilities have been dismantled, though they each retain ceiling tracks for lighting; however, neither studio is operational. One studio is now a storeroom, and the Learning Resources Center studio is used as a lecture classroom. The master control rooms and the film chain room have been also dismantled.

The Director of Learning Resources is responsible for administering the telecommunications facilities and provides

supervision to the audio-visual center. When the facilities are refurbished and re-equipped the Director will be responsible for supervision of the technical staff. The Director also serves as the college representative to the Bay Area Community College Television Consortium and works with the station manager of Peralta Television in planning the use of telecourses.

The College of Alameda will be experiencing a major telecommunications expansion when the local cable company, United Cable Television of Alameda, completes its franchise commitments. As part of United Cable's operating contract, the college Learning Resources Center studio will be completely re-equipped and brought to production standards. The studio will also have a two-way microwave link to Laney College's Theater Arts Building and PCTV's master control. The microwave link will enable PCTV programming to be broadcast to the College of Alameda and then to a Peralta channel on the United system.

Laney College

The college is located in downtown Oakland on fifty-nine acres near the city's Civic Center. Laney College enrolled 13,221 students, 3,026 full-time and 10,195 part-time, in the Spring Semester of 1993.

Telecommunications use at Laney College are restricted to viewing video cassette programs in the Learning Resources Center. These programs have been developed by faculty working with the Media Communications Department using their facilities and equipment. The

college has been sporadic in its involvement with the telecourses broadcast through the Bay Area Television Consortium.

Laney College offers a vocational training program in Media Communications, with a specialization in television. The department has extensive technical facilities and equipment. When the college was planned the Media department was to be housed in the Theater Arts Building. As a consequence, the theater facilities include cable conduits to various studios, practice rooms and theater. The media department does not produce programming on a regular basis for PCTV. However, advanced media students gain excellent technical experience by operating the studios for PCTV's live broadcasts.

The Theater Arts Building contains two active studios that are used by the Media Communications Department. One studio is used by advanced students, and additionally serves as a studio for the cable channel activities. Associated with the main studio is a control room which is also connected to the cable operations master control. The second studio and its control room are used by beginning students. Two additional media rooms are of studio size and layout, but are currently used as a storeroom and drama department rehearsal room. A room designated for production editing is currently a storeroom.

The 350 seat theater and its control room are used for large theatrical productions and are connected by conduits to the major studio's control room.

The programs produced in the advanced studio and by PCTV can be distributed via cable conduits to the Student Center, Library and Learning Resources Center, Forum (a large lecture hall), gymnasium and to the first four floors of the main office building of the campus.

An Assistant Dean of Instruction and the chairman of the Media Communications Department are responsible for scheduling the studios and control rooms. The Assistant Dean serves as the college's representative to the Bay Area consortium and works with the station manager to plan telecourse scheduling. The studios and control rooms serve both the Media Communications Department and Peralta Television which has resulted in problems when both groups need to use the facilities. To date this has not been a major problem but as PCTV expands its operations the conflicting needs for the use of the facilities must be resolved.

The potential for additional telecommunications activities at Laney College is very high. With the expansion of PCTV activities and the possibility of interconnecting the four urban college by cable, Laney's Theater Arts facilities will provide the nucleus for the district's telecommunication activities.

Merritt College

Merritt College is located in the east Oakland hills on 125 acres. The college enrolled 2,081 full-time and 6,800 part-time students in the Spring Semester 1983.

Telecommunications at Merritt is limited to the use of video cassettes in classes and in the Learning Resources Center. The

college has offered the Consortium telecourses regularly since 1979.

Merritt's telecommunications facilities are located in the Learning Resources Center which contains the television and audio-visual centers. Three rooms had been designed originally for television use. One room was constructed as an 1182-square-foot studio with two adjoining rooms to be used as production and transmission control rooms. Currently, one room is used as a lecture classroom while the other rooms are used as an office and storeroom.

Original equipment, such as a circular rack with backdrop curtains and ceiling lighting racks with associated wiring and control panels are still in place in the room planned for studio work. The rest of the facilities and equipment have been dismantled, and either sold or transferred to Laney College.

In the construction of the college conduits were included in the Learning Resources Center and the one classroom building. In the classroom building, cable conduits were installed in the lecture rooms, laboratories and several meeting rooms. The college's two other major instructional buildings and the gymnasium do not have conduits for cable.

The Associate Dean of Instruction represents the college to the Bay Area Consortium and works with the PCTV station manager and the Director of Telecommunications in the selection and scheduling of telecourses. The Associate Dean also has the administrative responsibilities for telecommunication development at the college.

There is a potential to expand Merritt College's uses of instructional telecommunications. The development of PCTV's

capabilities could mean greater in-class use of television. Merritt also has the potential to reactivate its studio and produce instructional material for campus use.

Vista College

The main offices of Vista College are located in the city of Berkeley, California in leased facilities. The college does not have a campus, offering its courses and programs in the urban communities served by the district. The college operates two outreach centers: the Downtown Oakland Business Education Center and the Fruitvale Education Center which is located in a predominantly Hispanic neighborhood.

The college had an enrollment of 10,299 students in the spring of 1983, 241 full-time and 9,988 part-time.

Vista's use of telecommunications consists of programming telecourses on the District cable channel, PCTV, and offering the telecourses sponsored by the Bay Area consortium. In addition, Vista offers telecourses broadcast on KCSM, a public television station operated by the College of San Mateo. The college also provides courses by video and audio cassette. The video cassette courses can be viewed at the Berkeley site or the Fruitvale Center. The Fruitvale Center can receive PCTV over Teleprompter of Oakland.

Vista College does not have facilities for telecommunications transmission or reception. A regular television antenna permits the audio-visual center to videotape telecourse lessons for student viewing. The audio-visual facilities consist of two small rooms:

one an office with video cassette players that are connected to the Career and Learning Center and a second room for storage.

The Assistant Dean of Instruction whose responsibilities are in the area of general education is responsible for the administration of telecourses. The Assistant Dean serves as the college's representative to the Bay Area consortium and also plans with the PCTV station manager the scheduling of telecourses for broadcasting.

Vista College is anticipating the telecommunications expansion of the District's operation. The college recognizes that the expansion is an opportunity to extend its programs into more industries, businesses and governmental agencies.

CHAPTER V

SUMMARY AND CONCLUSIONS

This research project was designed to provide information which would help the Peralta Community College District formulate a master plan for the development, coordination, and implementation of a district-wide telecommunications network. The three-part research was designed to (1) learn about the types of telecommunication systems that are available and being used for the delivery of instructional materials, particularly in higher education, (2) learn about coordinated and integrated telecommunications systems that are being used by educational institutions, the military and industry in the United States and other countries, and (3) learn about the current telecommunications activities, equipment and facilities in the Peralta District.

This chapter contains a brief summary of the salient points gained through an analysis of the different kinds of telecommunication systems and their uses by educational and noneducational organizations and recommendations for the formation of a coordinated, integrated telecommunication system by the Peralta District.

SUMMARY

Telecommunications are widely used in different formats and for different purposes by educational institutions, businesses, the military and foreign countries. The different formats of audio and video technologies include radio, broadcast television, cable television, Instructional Television Fixed Service, duplex microwave,

slow-scan television, satellite television, videotex, teletext and videodisc. Several of these technologies have interactive capabilities permitting individuals at different reception sites to interact with the originator at the time of transmission.

The use of radio to provide instruction to distant learners has been successful in several instances. However, it has not been widely adopted except for the use of SCA to deliver special programming to specific populations.

Video technologies have been used increasingly in education, business and military in the United States and in foreign countries. Business uses telecommunications for conferencing and staff training while the military have developed occupational specialty training and basic skills instructional uses. As the uses of video technologies have increased there has developed a diversity of available instructional materials to serve distant learners.

The primary advantages of telecommunications as a means to deliver educational programs are: (1) the ability to reach distant, homebound or sitebound learners, (2) the ability to link different sites and learners, and (3) the capability to free the student from time and place barriers to their learning. The use of television combines the best of audio and video technologies for learning at a distant.

The disadvantages to using telecommunications to provide instruction to non-traditional and distant learners are: (1) the expense of the equipment, (2) the expense of creating, producing and distributing learning materials, (3) the expense of updating the

learning materials, (4) the training necessary for both faculty and students to effectively use the media for learning, and (5) the rapid changes that occur in telecommunication technologies which lead to obsolete systems. Educational institutions will need to develop methods to minimize the disadvantages if they are to respond to the increasing demand for learning at a distance.

Cable television is the most efficient and cost effective telecommunications system to deliver instructional programming. When used in an integrated system with an earth station dish and ITFS, a telecommunication system results that can receive educational programming from satellite transmissions, and broadcast via cable or ITFS to specific sites. Another benefit of an integrated system local programs can be broadcast to the general public by cable or to selected audiences by ITFS.

Higher education's greatest use of video telecommunications is in the area of cable television. Many colleges and universities have dedicated channels and direct access to cable system headends. Cable television offers the greatest opportunity in the future for higher educational institutions to expand their outreach to distant learners.

The uses of telecommunications technologies by higher education institutions have increased as their efforts to serve the non-traditional and distant learner populations have expanded. As the technologies are improved, interactive capabilities are developed and as the cost of equipment and materials reduced, more institutions will begin to use telecommunications to provide educational

opportunities for non-traditional and distant learners.

CONCLUSIONS

The three components of this study summarized above lead to three conclusions: (1) an extensive telecommunications technology is being used to deliver education to non-traditional and distant learners; (2) the Peralta Community College District can expand its alternative instructional and community services programs through the development of an integrated, coordinated telecommunications system; (3) the Peralta Community College District has the basic facilities, equipment and staff necessary to expand its telecommunications operations into a model system.

The integrated telecommunications plan for the Peralta Community College District should concentrate on using satellite, ITFS and cable technologies. The integration of these technologies into systems has occurred due to their technical compatibility, efficiency of operation and cost effectiveness. Integrated telecommunication systems have demonstrated that they are an effective means of meeting the educational needs of non-traditional and distant learners. Several outstanding integrated telecommunication systems can serve as models for the Peralta District. Those systems are highly centralized in their operation and have consistently involved faculty in the planning, development and implementation. In those community college districts with multiple institutions, all of the institutions are active participants in the origination and reception of instructional programming in order for the program to be

successful.

The Peralta Community College District plans to expand its telecommunication capability to serve all of the district's residents. The current and proposed telecommunications activities need to be organized according to a central district planning and coordinating mechanism if they are to result in an educational television network that will meet the needs of the district.

RECOMMENDATIONS FOR IMPROVEMENT OF PRACTICE

The following recommendations are a result of lengthy interviews and discussions with telecommunications specialists and analysis of the current state of the Peralta Community College District's telecommunications activities and facilities. It is suggested that these recommendations be used to formulate a five-year plan for the sequential development of a telecommunications system in the Peralta District.

1. Integrate the Peralta Community College District's existing telecommunication elements into a districtwide system. Two telecommunication elements are currently operational: the earth station and the cable channel, PCTV. By coordinating the use of the earth station with the cable channel operation, additional and more diverse programming will be available. The earth station can receive the satellite transmissions of the Appalachian Community Service Network (ACSN) which will increase the number of telecourses that can be broadcast PCTV.

2. Immediately activate the district's two ITFS channels.

Purchase the transmission and reception equipment necessary to begin broadcasting on the allocated ITFS channels. To enable PCTV to be received by the two cable systems serving the communities of Albany and Berkeley, install receivers and down converters at the cable company headends. Additional receivers should be installed at Merritt College, Vista College, East Bay Skills Center and the three education centers. Equipment needed to begin transmission and reception is itemized in Appendix D.

3. Plan and construct a television facility that will serve as master control for Peralta Colleges Television, PCTV. The Peralta District must increase the space currently used by PCTV for its master control. Facilities will become a critical issue with the activation of the ITFS system and the microwave connection with the College of Alameda. Consideration should be given to either constructing a separate building on District property or remodelling existing space at one of the colleges. Construction of a separate facility is the most desirable because it would permit the facility to be designed to meet the specific needs of a telecommunications program. An alternative is to determine if appropriate usable space exists at the three campus-based colleges.

Laney College is the logical central location for the District's telecommunications facilities. The college is centrally located in the district, and its nine-story office building is an ideal location for a transmission tower and antennae. This building has line-of-sight capability to all of the district's colleges and centers, cable television company headends, University of California

at Berkeley, California State University at Hayward, and Alameda County Schools Office. The other Peralta colleges do not have this wide line-of-sight capability. By installing a transmission tower on the Laney building, all of the reception and transmission sites of the proposed East Bay Higher Education Television Consortium (HITEL) can be reached.

If a separate telecommunications facility is built on District property adjacent to Laney College, this new facility could use the antennae tower on the Laney office building, but the transmission signal would have to be either microwaved to a receiver or carried by cable and then retransmitted. Due to the length of the cable from the point of signal origin to the tower antenna, in-line amplifiers would be required to have a signal of broadcast strength.

Therefore, it is recommended that the ninth floor of the Laney College office building which is currently being used for storage, be assigned to Peralta Colleges Television. This could provide the necessary space for PCTV to operate a centralized telecommunications center. Appendix B lists proposed space utilization of the ninth floor of the Laney College office building.

4. Plan for additional ITFS reception sites. The development of an ITFS network should include a number of community sites. These sites include public libraries, hospitals, and community education sites. Including these sites in the ITFS system will make telecommunications offerings more accessible within the district.

5. Prepare for the activation of the cable system in the City of Alameda. Detailed plans should be developed that coordinate the

activation of the College of Alameda's television studio and PCTV's broadcast schedule on Alameda's cable.

6. Actively advocate for the needs of educational institutions during the cable refranchising of the City of Oakland. The Peralta District should develop a set of specific needs that can be incorporated into the new cable franchise. As a minimum, this should include a) a two-channel institutional loop with two-way capability to all of the district's Oakland facilities, b) dedication of a channel for PCTV, c) an initial equipment grant for outfitting the new PCTV facilities and refurbishing Laney College's television equipment, d) annual grants to maintain the equipment and facilities, and e) inclusion of ACSN as a regular broadcast channel which would be controlled by Peralta Colleges Television.

7. Plan a series of workshops to inform faculty of the potential uses of an expanded telecommunications network. It is important to involve the faculty in all phases of development and implementation of telecommunictions instruction. Faculty should be directly involved in the development of telecourse broadcasting from the different campuses. The faculty will need technical training and support to ensure that the district's telecommunications network is used to its maximum potential.

8. Adopt and implement an organizational plan for the supervision and operation of Peralta telecommunications. The inclusion of ITFS, the duplex microwave connection to the College of Alameda, the transmission to the headends of two cable companies, and the transmission to and reception from the University of California

at Berkeley will require an expanded staff at PCTV. Appendix E proposes an organizational structure for Peralta Telecommunications encompassing the activities of five full-time positions.

9. Develop procedures to allocate broadcast time for instruction and community services. With well-defined procedures the demand for instruction and community services broadcast hours can be satisfied. The daily broadcast schedule should be programmed to achieve maximum viewer participation. Instructional telecourses and seminars should receive primary consideration in the allocation of broadcast hours. Community services, public affairs and athletics should have broadcast times of secondary importance.

10. Develop a studio and control room at Merritt College. The district should plan for the development of a studio that can serve as a broadcast origination facility at each college. The College of Alameda and Laney College will have studio facilities from which instructional programs can be originated. With the development of a studio at Merritt College and a two-way institutional loop, programs originated at any of the campus colleges can be broadcast throughout the telecommunications network. This multiple point origination loop with distribution system-wide provides an opportunity to offer instruction to individual sites throughout the district that do not have sufficient enrollment to justify classes at one site.

11. Install cable and telephone lines to classrooms on both Laney and Merritt College campuses. Classrooms wired to receive cable transmissions should have telephone lines installed in order to provide interactive capability. Courses that have limited on-campus

enrollments at one college could enroll students from the other colleges and achieve an enrollment sufficient to sustain the class.

12. Adopt a plan for the expansion of existing telecommunications and the sequential acquisition of additional telecommunication systems. These telecommunication systems should include: a) acquisition of additional ITFS channels, b) use of FM radio with its associated Subsidiary Carrier Authorization, c) use of low power television, and d) development of interactive cable, videodisc and slow-scan television capabilities. The addition of these telecommunication systems expand the educational options for non-traditional and distant learners.

STRATEGIES FOR DIFFUSION, IMPLEMENTATION AND CHANGE

Considering the recommendations previously discussed as a planning framework, it is proposed that the Peralta Community College District implement a comprehensive plan that will integrate the district's telecommunications elements and the activities of the four urban colleges into a more functional and effective system in the next five years. It is anticipated that the district can support a portion of the costs of implementing such a plan. Additional funding from external sources will be necessary for completion of the system, but it is expected that adequate district resources will be available for the operation and maintenance.

The following suggestions are designed to encourage the implementation of the planning recommendations noted previously.

1. Identify appropriate personnel. A full-time administrator

must have responsibility and authority for the implementation of the district's telecommunication activities if the planning recommendations are to be accomplished. This administrator should have direct reporting access to the district Vice Chancellor. Additional personnel are described in Appendix E.

2. Establish a districtwide advisory committee. This committee should assist in implementing the plan, coordinating telecommunications activities and evaluating the system operations. It should be an administrative and faculty advisory group composed of two representatives from each of the urban Peralta colleges and three representatives from Peralta Telecommunications, the Director of Telecommunications, the Manager of Peralta Colleges Television Operations and the Director of Programming. This committee should meet regularly to give direction to telecommunications plans.

3. Establish an advisory subcommittee on instructional programming. A subcommittee of the districtwide advisory committee should be established to determine instructional programming. It should be composed of faculty, instructional administrators and student representatives of the four urban colleges and be chaired by the Director of Telecommunications. This subcommittee will preview and select telecourses for broadcast and recommend courses to be developed by Peralta faculty for live and interactive broadcasts between the colleges. This subcommittee will encourage the direct active participation of Peralta faculty in the eventual telecommunication system.

4. Organize staff development program for telecourse

instructors. To ensure a successful instructional telecommunications network, faculty need to understand how a telecourse is developed and presented, as well as the faculty role in this instructional format. A series of workshops with appropriate materials should be developed about the roles of the faculty, support staff and students in individualized telecommunications learning, the different types of telecommunication elements, and the kinds of students who prefer this type of learning.

5. Disseminate information about telecommunication activities. The existing Peralta Colleges Television newsletter should be adapted and expanded to include articles on teaching and learning issues; it could also encourage interactive communication between faculty, administrators and telecommunications personnel. The newsletter should include brief articles on how to make telecommunication instruction a success, what works, and what type of college support services are available. The sections on telecommunications staff and their activities should be expanded feature their special projects.

6. Develop an ongoing evaluation plan. An evaluation plan should be designed that enables the districtwide advisory committee to evaluate a) the progress of implementing the five-year plan, b) the effectiveness of the telecommunications system in providing instruction and community services activities to Peralta residents. The results of both evaluation components should form the basis for an annual review of telecommunications which should lead to adjustment or redirection of goals for each stage of the development process.

It is likely that higher education's use of telecommunications will increase as many institutions expand their instructional programs to meet the needs of non-traditional and distant learners. The conclusions and recommendations included in the Peralta Master Plan encompasses the major developmental stages and tasks that are required for effective, efficient use of telecommunications in educational programming. Schools and districts that plan to take advantage of this constantly changing technology should be aware and sensitive to the preliminary and ongoing planning and evaluation steps that are necessary for its successful implementation. By attempting, from the very beginning, to work towards a coordinated telecommunication system, educational institutions will be able to adapt their instructional and community service programming to the new technologies and continue to provide programs that make higher education accessible to non-traditional and distant learners.

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APPENDIX A

PERALTA COMMUNITY COLLEGE DISTRICT
TELECOMMUNICATIONS EQUIPMENT INVENTORY

Item	Useable	Condition Repairable	Discard
College of Alameda			
(1) Video recorder: Black and white 1/2 inch	X		
(1) Video camera, black and white	X		
(2) Video tape recorder, portable, black & white 1/2"	X (1)	X (1)	
(2) Camera adapter	X		
(4) Monitor, black & white, variable size	X		
(1) Tripod, video	X		
(1) Special effects generator	X		
(1) Video switcher	X		
(1) Talkback system	X		
(3) Monitor, color, variable size	X		
(1) Video camera, color	X		
(3) Camera adapter	X		
(4) Video cassette recorder, 3/4 inch	X (3)	X (1)	
(1) Film chain	X		
(2) Tripod	X		
(3) Headset	X		
(10) Light, TV	X		
(2) Light stands	X		
(1) Production console	X		
(1) Character generator	X		
(1) Editing system	X		
Laney College			
(5) Video camera	X (4)	X (1)	
(5) Video tape recorder	X		
(2) Video cassette recorder	X		
(1) Character generator		X	
(1) Film chain	X		
(2) Audio mixer	X		
(1) Switcher with chromakey	X		
(2) Waveform monitor	X		
(1) Vectorscope	X		
(1) Light-board and colortram instruments	X		
(15) Monitor, black and white, color, variable size	X		
(1) Power supply	X		
(2) Synchronous generator	X		
(1) Video mixer	X		
(1) Video switcher	X		
(1) Editor			X

APPENDIX A (continued)

Item	Useable	Condition Repairable	Discard
Merritt College			
The equipment at Merritt College had been totally dismantled and cannibalized. The equipment that remained should be discarded.			
Vista College			
(13) Video Cassette recorder, 3/4 inch	X		
(3) Video cassette recorder, 1/2 inch	X		
(6) Video camera, color	X		
(1) Video camera, black and white	X		
Peralta Community College District - Peralta Colleges Television			
(1) Special effects generator	X		
(6) Remote control systems	X		
(2) Video camera, color	X		
(2) Monitor, video	X		
(1) Monitor, waveform	X		
(3) Rack frame	X		
(2) Switcher	X		
(1) Synchronous, generator, color	X		
(1) Audio mixer	X		
(2) Video tape recorder	X		
(1) Subcarrier D.A.	X		
(1) Pulse D.A.	X		
(1) Video D.A.	X		
(1) Optical multiplexer	X		
(1) Black Burst generator	X		
(1) Laser transmitter - Receives system	X		
(1) Earth satellite dish	X		

APPENDIX B

PROPOSED SPACE UTILIZATION ON THE NINTH FLOOR LANEY COLLEGE OFFICE BUILDING FOR PERALTA COLLEGES TELEVISION

Function	Square Footage
Master Control Room	464
Technical Office	64
Film Chain Room	64
Audio Announcement Room	224
PCTV Staff Offices	224
Studio A	600
Studio B	512
Studio A and B Control Room	256
PCTV Technical Shop	256
PCTV Storage	560

APPENDIX C

INSTRUCTIONAL TELEVISION FIXED SERVICE FREQUENCY AUTHORIZATION IN THE SAN FRANCISCO BAY AREA FEDERAL COMMUNICATION COMMISSION, SEPTEMBER 3, 1982

GROUP	CHANNEL	FREQUENCY	AUTHORIZATION
A	1	2500-2506	University of California, Berkeley
	2	2512-2518	University of California, Berkeley
	3	2524-2530	Peralta Community College District
	4	2536-2542	Peralta Community College District
B	1	2506-2512	Roman Catholic Archdiocese
	2	2518-2524	Roman Catholic Archdiocese
	3	2530-2536	Roman Catholic Archdiocese
	4	2542-2548	Roman Catholic Archdiocese
C	1	2548-2554	Unassigned as of September 1982
	2	2560-2566	Unassigned as of September 1982
	3	2572-2578	Unassigned as of September 1982
	4	2584-2590	Unassigned as of September 1982
D	1	2554-2560	Unassigned as of September 1982
	2	2566-2572	Unassigned as of September 1982
	3	2578-2584	Unassigned as of September 1982
	4	2590-2596	Unassigned as of September 1982
E	1	2596-2602	Stanford University
	2	2608-2614	Stanford University
	3	2620-2626	Stanford University
	4	2632-2638	Stanford University
F	1	2602-2608	Unassigned as of September 1982
	2	2614-2620	University of California, San Francisco
	3	2626-2632	Unassigned as of September 1982
	4	2638-2644	University of California, San Francisco
G	1	2644-2650	Roman Catholic Archdiocese
	2	2656-2662	Roman Catholic Archdiocese
	3	2668-2676	Roman Catholic Archdiocese
	4	2680-2686	Roman Catholic Archdiocese

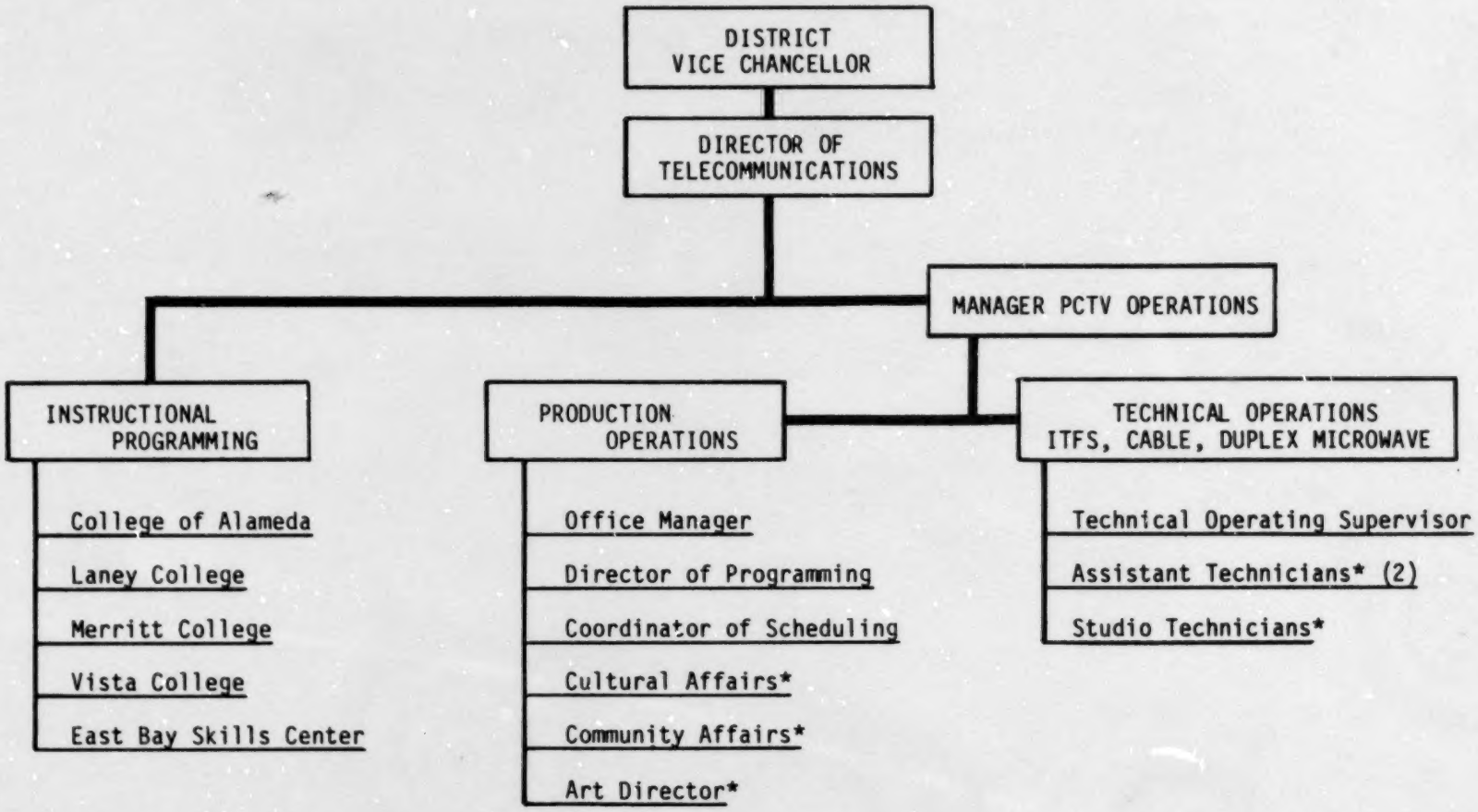
APPENDIX D

EQUIPMENT REQUIRED FOR THE OPERATION OF THE TWO ITFS CHANNELS, A-3 AND A-4

QUANTITY	EQUIPMENT	COST
2	ITFS Transmitters Emcee TTS-10FW/Mudell	$43,500
10	ITFS Receivers/Downconverters ICS Model 1093 WHF Downconveter	9,550
1	Antenna Bogner B850	13,000
1	Antenna Tower - 80 Foot Rohem Tower	2,500
1	Switches: 3M-15X Routing Switcher	6,700
2	Limiters: Audio Limiters (A-3, A-4) CBS FM Volumax 4100	400
1	Amplifier	3,000
1	Signal Generator	5,000
1	Waveform Monitor	2,178
1	Monitor: Video Picture Monitor, TEK 650HR	5,350

APPENDIX E

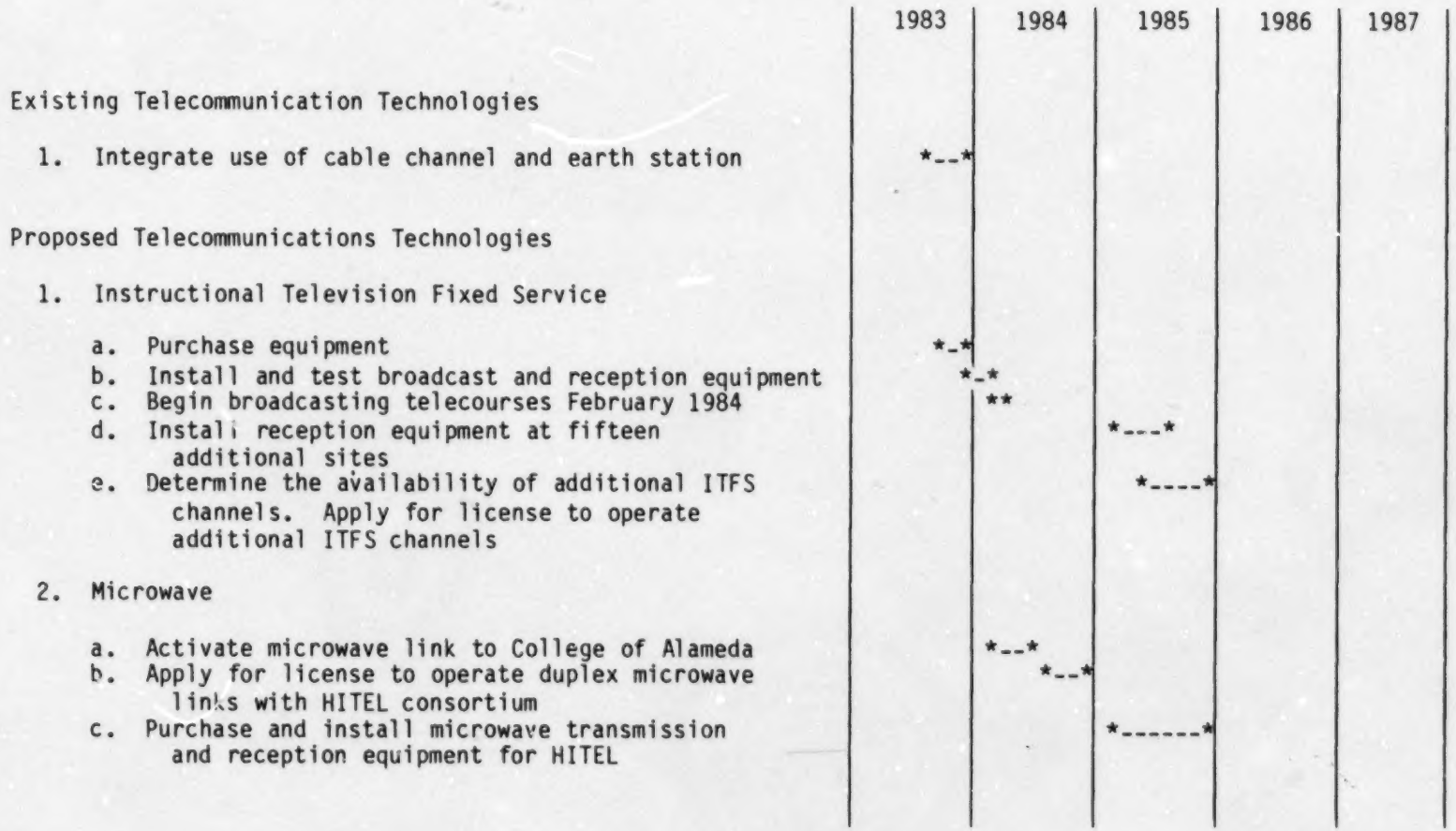
PERALTA TELECOMMUNCATIONS:
PROPOSED ORGANIZATION OF PERSONNEL



*These positions are half-time and should be filled with experienced Media Communications students from Laney College's instructional program

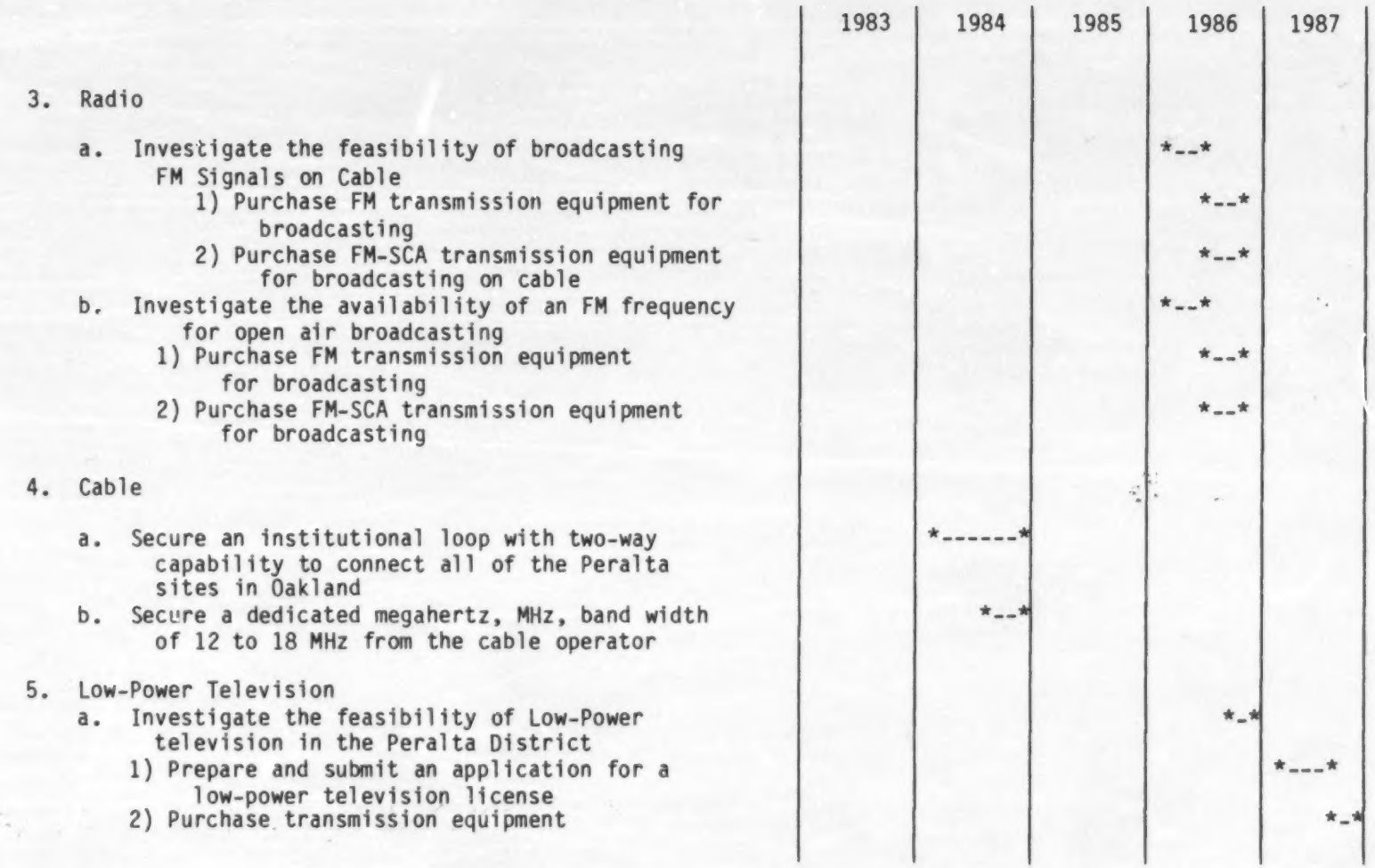
APPENDIX F

PERALTA TELECOMMUNICATIONS
A FIVE-YEAR PLAN


1983
1984
1985
1986
1987
Existing Telecommunication Technologies
1. Integrate use of cable channel and earth station
Proposed Telecommunications Technologies
1. Instructional Television Fixed Service
a. Purchase equipment
b. Install and test broadcast and reception equipment
c. Begin broadcasting telecourses February 1984
d. Install reception equipment at fifteen additional sites
e. Determine the availability of additional ITFS channels. Apply for license to operate additional ITFS channels
2. Microwave
a. Activate microwave link to College of Alameda
b. Apply for license to operate duplex microwave links with HITEL consortium
c. Purchase and install microwave transmission and reception equipment for HITEL

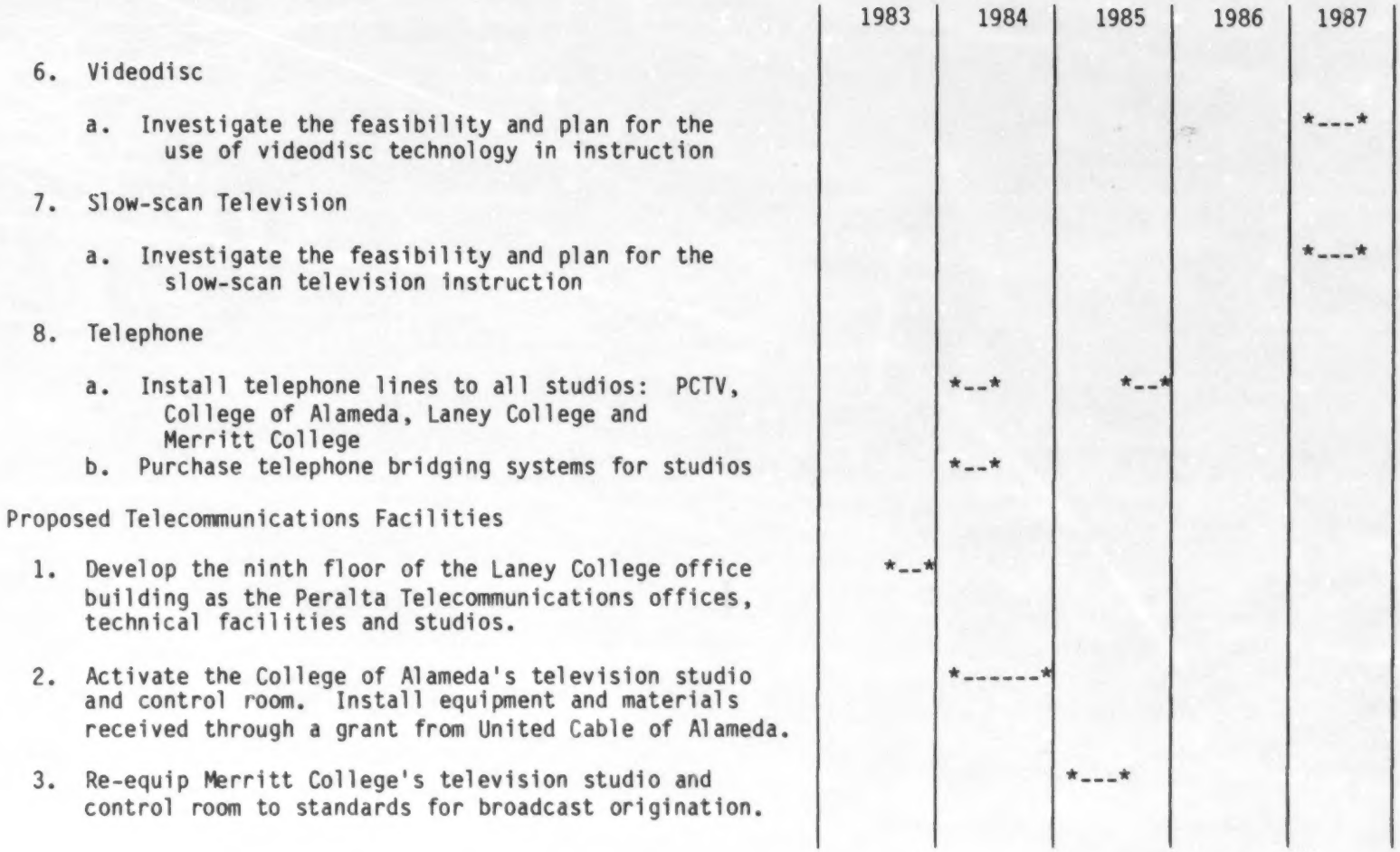
124

APPENDIX F (continued)
PERALTA TELECOMMUNICATIONS


1983
1984
1985
1986
1987
3. Radio
a. Investigate the feasibility of broadcasting FM Signals on Cable
1) Purchase FM transmission equipment for broadcasting
2) Purchase FM-SCA transmission equipment for broadcasting on cable
b. Investigate the availability of an FM frequency for open air broadcasting
1) Purchase FM transmission equipment for broadcasting
2) Purchase FM-SCA transmission equipment for broadcasting
4. Cable
a. Secure an institutional loop with two-way capability to connect all of the Peralta sites in Oakland
b. Secure a dedicated megahertz, MHz, band width of 12 to 18 MHz from the cable operator
5. Low-Power Television
a. Investigate the feasibility of Low-Power television in the Peralta District
1) Prepare and submit an application for a low-power television license
2) Purchase transmission equipment

125

APPENDIX F (continued)
PERALTA TELECOMMUNICATIONS


1983
1984
1985
1986
1987
6. Videodisc
a. Investigate the feasibility and plan for the use of videodisc technology in instruction
---
7. Slow-scan Television
a. Investigate the feasibility and plan for the slow-scan television instruction
---
8. Telephone
a. Install telephone lines to all studios: PCTV, College of Alameda, Laney College and Merritt College
--
--
b. Purchase telephone bridging systems for studios
--
Proposed Telecommunications Facilities
1. Develop the ninth floor of the Laney College office building as the Peralta Telecommunications offices, technical facilities and studios.
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2. Activate the College of Alameda's television studio and control room. Install equipment and materials received through a grant from United Cable of Alameda.
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3. Re-equip Merritt College's television studio and control room to standards for broadcast origination.

126

APPENDIX F (continued)
PERALTA TELECOMMUNICATIONS

	1983	1984	1985	1986	1987
4. Wire three classrooms at both Laney and Merritt Colleges for cable television reception. Have separate telephone lines installed to each classroom.		*--*			
Proposed Telecommunications Personnel					
1. Appoint a Director of Telecommunications	*				
2. Employ a Supervisor of Technical Operations	*				
3. Appoint a manager of Peralta Colleges Television		*			
4. Appoint a districtwide advisory committee (Committee meets on a regular basis)	*				
5. Establish an advisory subcommittee on instructional programming. (Subcommittee meets on a regular basis)	*				
6. Employ an Office Manager	*				
7. Employ a Director of Programming		*			
8. Employ advanced students from the Media Communication Program for various technical and office operations	*				
9. Establish a staff development program for telecourse instructors. The program is ongoing with sessions conducted on all campuses.		*			

ERIC Clearinghouse for Junior Colleges
8118 Math-Sciences Building
University of California
Los Angeles, California 90024
APR 27 1984